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Society for the Encouragement of Arts, Manufactures, and Commerce,

ADELPHI, LONDON.

ONE-HUNDRED-AND-SECOND SESSION, 1855-56.

CATALOGUE

OF THE

EIGHTH EXHIBITION OF INVENTIONS.

Being Appendix I. to Vol. IV. of the "Journal of the Society of Arts."

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1856.

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CATALOGUE

OF THE

EIGHTH EXHIBITION OF INVENTIONS,

BEING A COLLECTION OF ARTICLES RECENTLY INVENTED, PATENTED, OR REGISTERED,
EXHIBITED AT THE SOCIETY'S HOUSE DURING THE MONTH OF APRIL, 1856.

N.B.—The Council wish it to be distinctly understood that they are not responsible for any of the statements contained in this Catalogue. They regret that in several instances Exhibitors have failed to supply descriptions. They have to thank several of the Exhibitors for the loan of the wood blocks used to illustrate it. Where an asterisk (*) is prefixed to a number, it denotes that the article exhibited is a drawing.

MOTIVE MACHINES, INCLUDING RAILWAY MECHANISM.

*1. Patent Smoke Consuming Apparatus; J. Lark.

This plan consists in the admission of air at the back of the fire, between an under bridge and an overhanging bridge.

2. The Moderator Patent Furnace; David Mushet.

In these models it is proposed to unite in one simple action all the desiderata which the most competent writers on smoke prevention have indicated as requisite to success. 1. Facility for light, heavy, or gradual firing, without the waste of heat occasioned by the rush of cold air through an open fire-door. 2. Admission of fresh air, to ignite the gases superabundantly distilling during the first minutes after charging, such admission being exactly proportioned by the arrangements, to the admission of coal. 3. Increased space in the furnace, during charging, giving more room for the ignition of the gases before they reach the cooling boiler surface. 4. An open fire near the bridge, where the larger coals roll down, the small remaining to distil slowly at the front of the grate. 5. Considerable diminution of labour in filling the feeding-boxes instead of throwing the coal to the back of the furnace. 6. Facility for cleaning the bars and removing clinkers; the coal-boxes being unpinned from the levers, the front of the grate can be depressed below the edge of the front curved plate; the grate being then inclined forward, the clinkers are easily drawn out. 7. By the same action, a film of fresh air can, when required, be admitted close over the surface of the green fuel, a much more efficient means than the practice, often adopted, of leaving the fire-door ajar, which creates an eddy, and a very partial distribution of air over the gas-evolving surface. The sectional models, A and B, represent different arrangements (which may be otherwise varied) of levers, feeding-boxes, and air-distributors. In B, the lever is attached to a cradle, supporting and staying the grate, which rocks free upon it. The feeding-boxes in B may be filled on the floor, and run up a rail into their position. The air in B is admitted through grooves at the bridge, and in the front plate, instead of through a grating, as in A. 8. By placing the two sectional models together, a double furnace is exhibited, for alternate firing, an arrangement generally admitted to be very efficacious in preventing smoke. When the coal is very bituminous, or where multi-tubular boilers demand a fuller provision for igniting the gases within the furnace, one-half or two-thirds of the front of the grate only may be made to oscillate, and the back part fixed in the usual manner, the curved air-plate being attached to the front fixed bearer. The front of the grate being brought into position when the fresh charge is thoroughly ignited, the incandescent fuel is pushed back to the fixed bars, and a bright fire always maintained in this quarter. The fire can be dressed and levelled without setting open a door, either underneath the front curved plate, or else by a small opening in it closed with an escutcheon. This construction of furnace will be convenient for the combustion without smoke of raw coal under the boilers of locomotive engines. Some engineers object to the perfect combustion of coal and the development of flame, as proving destructive to the boiler-plates. This alleged more rapid wear may be a great fact, because when there is a minimum of air in the furnace, and the gases wastefully pass off unconsumed, they are loaded with carbon vapour, which is very preservative to iron under heat; and when there is air enough for perfect combustion, the gases are oxidised and acidified, and, therefore, likely to be more destructive; but if it be an object to obtain the greatest heat from the fuel, this can only be effected by the production of flame. The old hanging bridge, which is re-patented about six times every year, may be applied to this furnace. If placed a little behind the axle, the opening will be increased by the depression of the hinder end of the grate, and give the charge free passage downwards; this avoids one great drawback to the hanging bridge—the small space for pushing the fire backwards. To ensure the free delivery of the charge of fuel, the feeding-boxes must be finally tilted to an angle of 45°, and a gradual delivery is facilitated by their travelling on a notched slide, to give the movement a succession of jerks. By the attachment of alternating mechanical power a strictly self-feeding furnace may be arranged.

3. Patent Smoke Deflecting Apparatus; E. V. Gardner.

This invention is self-acting, and has no moving parts. It is equally applicable to locomotives, marine engines, and multitubular boilers of all kinds; also to open fires. By this invention a proper supply of air is obtained, in a state of intense heat and purity, for the combustion of the gases from the green coal; and by means of absorbent plates or diaphragms, a constant supply of air is kept at a sufficient heat throughout the whole period of combustion, insuring the perfect oxidation of the remaining carbon, which would otherwise escape as carbonic oxide. The smoke and inflammable products are also presented to this hot-air supply in a state of incandescence, whereby chemical combustion is produced.—See the *Civil Engineer and Architects' Journal*, December, 1855; *Mechanics' Magazine*, Sept. 29, 1855; *Railway Record*, Oct. 13, 1855; *Mining Journal*, Oct. 20, 1855.

4. Fire Bar for Unpatented Argand Fire-grate, for Preventing Smoke in Steam Engine Furnaces; R. Armstrong.

This fire-grate is precisely on the same principle as the Argand lamp, admitting the air in a self-regulating thin film, between the ends of two lengths of these adjustable fire-bars, near the middle of the grate.

*5. Patent Regulating Valve for Furnaces; M. Allen.

This valve is formed by fitting in the body of a plate, swung centrally on two pivots or axes, a vessel made somewhat in the form of an hour-glass, the narrow centre of this vessel being on a line with the pivot on which the plate swings. One side of the vessel is charged with sand or other suitable material, and through the centre of the vessel is placed a slide, or its equivalent, which is worked by a thumb-screw. In order to set the valve, that half of the plate which carries the weighted part of the vessel is placed uppermost, and the valve-plate is open, both at top and bottom. It is prevented from falling over inwards by a rack or other suitable contrivance. When the slide is opened to the desired extent, the sand falls with more or less rapidity into the under part of the vessel, and, as it does so, gradually brings the valve-plate into an upright position, and so closes the passage to which it is fitted. Instead of the hour-glass shaped vessel being fixed to the body of the valve-plate, it may be connected to one of the pivots on which the plate swings, or it may be fitted to the plate in any other convenient manner. In Fig. 1 is shown a front elevation, and in Fig. 2 a section of one of the improved valves; Fig. 3 is a plan of the adjustable slide fitted in the centre of the valve; A A is a box or case; B B is a metal plate, free to swing upon its axes, C C, supported in the sides of the case at *a a;* D D is a vessel of the particular shape shown, made in two parts, united at the collar *b;* E is a plate or disc of metal interposed between the two parts of the vessel, D. This plate is slotted out or cut away from *c* to *d*, while a thumb-screw, F, working through the collar, *b*, regulates the size of the aperture in the disc. The vessel, which is made by preference of glass, is accurately fitted into the plate, B, and before being fixed therein has one of its parts filled, or nearly filled, with sand, or other suitable material, which will act in a similar manner to sand, for the purpose required; *e* is a rack held in an inclined position between the arm, *f*, and ledge, *g*. In fitting one of these valves to regulate the supply of air to an ordinary stationary furnace, a passage or air-flue is formed, leading from the front of the brickwork in which the furnace is set to a box at the back of the furnace-door. This box is perforated, to divide the air entering into numerous small jets or streams. The case and valves are fitted into the mouth of the air passage. On a fresh supply of fuel being introduced into the furnace, that part of the valve containing the sand or other suitable material is turned upwards, and inclined backwards against the rack, which will place the valve in the position in which the greatest amount of air can pass through it. The inclination of the valve, and consequently the volume of air allowed to flow in, may be increased or diminished by moving the rack backward or forward. The sand running from the upper to the lower part of the vessel will gradually lessen the inclination of the valve, and consequent inflow of air, until the valve assumes the horizontal position, and closes the passage. The valve may, if it is thought desirable, be fitted to an ash-pit, or to a casing at the side of a furnace-door, or in any other convenient position. (See *Mechanics' Magazine*, Nov. 17, 1855.)

Fig 1.

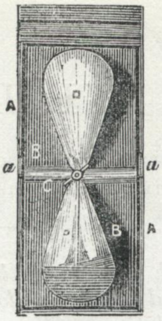


Fig 2.

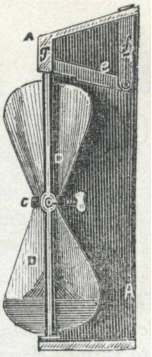
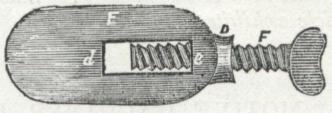


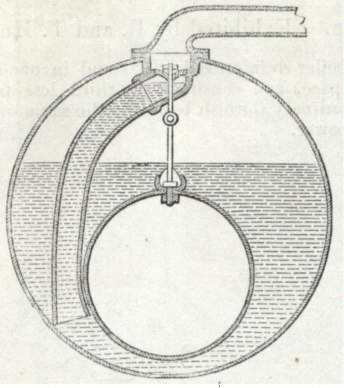
Fig 3.



5a. Patent for Consuming Smoke and Economizing Fuel; — Cliff. Exhibited by Robertson, Brooman and Co.

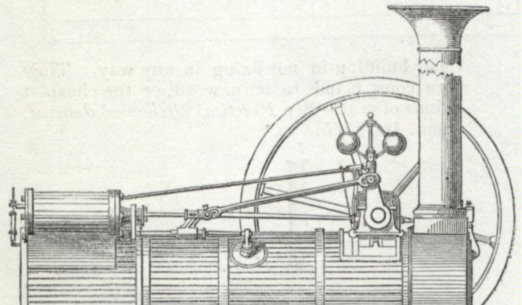
This invention consists in admitting into, and shutting off from, furnaces a supply of atmospheric air through valves or apertures, the opening and closing of which are regulated by a float piston or plunger, worked by liquid, whether such admission of air take place through the furnace door, over the door, or through passages opening into any desired part of the furnace.

6. Safety Apparatus for Steam Boilers; W. Kemble Hall. Exhibited by F. Conder and Co.



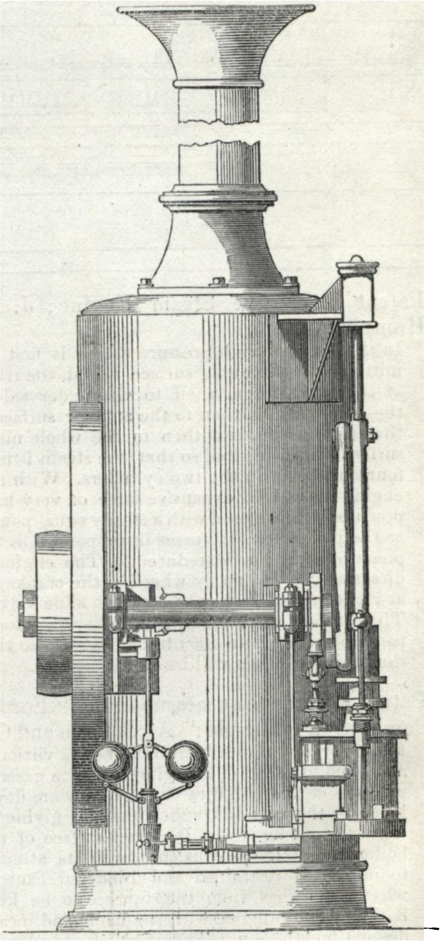
This apparatus consists of a valve, communicating with the water in the boiler, and retained in its seat by a rod which terminates with a button, soldered with tin, or other easily fusible metal, in a copper cup riveted to the crown of the furnace. If the water should become low and the boiler overheated, the valve will be released and the water and steam blown from the boiler, which may thus be destroyed by the negligence of the stoker, but cannot be exploded. (See *Minutes of Proceedings of the Institution of Civil Engineers*, Session 1855-6.)

7. Patent Cup Surface Steam Boiler, adapted for Locomotive or Stationary purposes; — Barran. Exhibited by R. and T. Hughes.



In the locomotive form, as stationary boilers, they have been set up in factories in the city of London, requiring no brickwork whatever for fixing; a cast iron base at the fire-box end, and a cast iron column at the smoke-box end (the latter serving for a descending flue when needed) being all that is required for that purpose; consequently, they may be (as they have been) set up and connected with an engine in a few hours, and put to work immediately. Some of the advantages of these boilers are, that (besides the facility and economy in fixing them) they occupy one-third less space, and save at least one-third the expense of fuel required for ordinary boilers: they can be efficiently worked with common gas coke, by which the smoke nuisance is avoided; and steam has been got up in the model boiler exhibited, which holds seven and a half gallons of water, from cold water (at a temperature of 68° Fahr.), and blown off at a pressure of 30 lbs. to the square inch, in five minutes from the time of lighting the fuel. The evaporative power of this model boiler has been tested by Mr. D. K. Clark, and proved to be equal to the evaporation of between 11 and 12 lbs. of water per 1 lb. of ordinary coke, with a consumption of 18 to 21 lbs. of coke per foot of grate per hour. One of 12 horse-power, has been proved to have consumed 28 lbs. of common gas coke per square foot of grate per hour, and at that rate of consumption to have evaporated 10 lbs. of water per 1 lb. of coke. A 12 horse boiler, of similar size to the latter, has been at work for sixteen months, at Messrs. Collinge and Co.; gas coke only has been used, and the evaporation has been found to be 10½ lbs. of water per pound of coke.

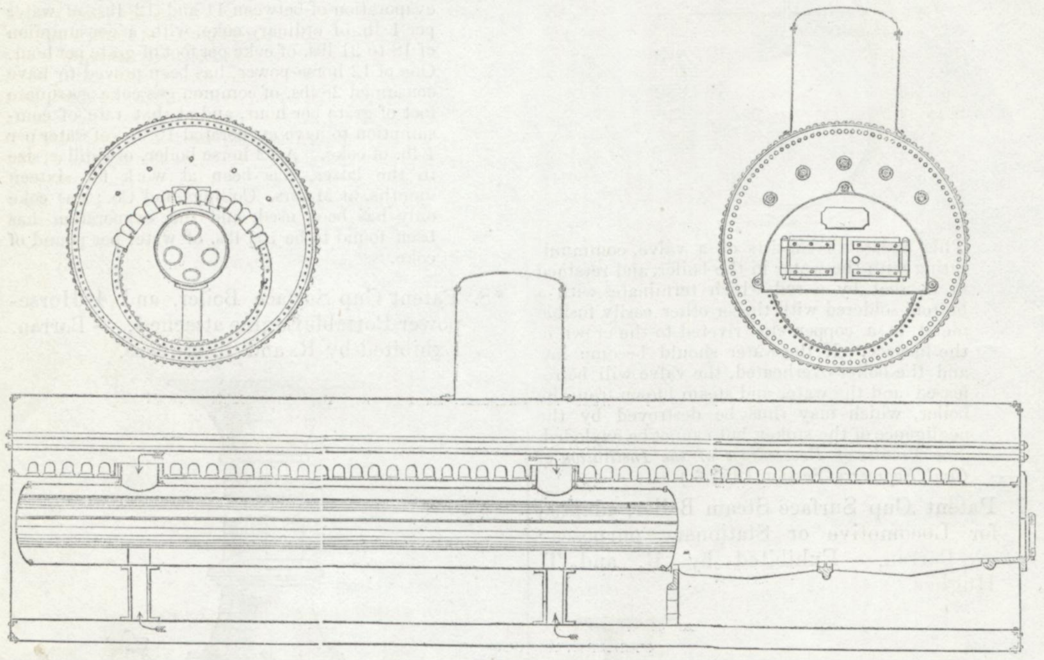
*8. Patent Cup Surface Boiler, and 4 Horse-power Portable Engine attached; — Barran. Exhibited by R. and T. Hughes.



In an upright cylindrical form, many of these boilers have been at work in London and its neighbourhood for a long time. When of 4 or 6 horse-power, they stand on a cast-iron base 3 feet 3 inches square, the boiler and base being less than 6 feet high. Their evaporative power has been proved to the extent of 98 gallons of water per 80 lbs. of common gas coke—equal to 12·25 lbs. of water per lb. of coke.

*9. Cup Surface improved Cornish Boiler; — Barran. Exhibited by R. and T. Hughes.

By these improvements it is said that 40 per cent. of heating-surface, in the best position for retaining and utilising the heat, is gained over the ordinary form of Cornish boiler; and the boiler so improved will stand in one-third less space, and consume one-third less fuel, than ordinary Cornish boilers of the same evaporative power.

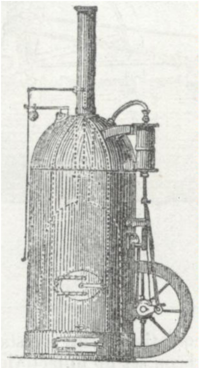


*10. Patent Expansive Steam Engine; J. D. Humphreys.

In this engine high-pressure steam is first admitted to the annular surface round the trunk of the small piston, then to the under side of the same piston, then to the annular surface of the large piston, and then to the whole under surface of the piston, so that the steam is used four times over in the two cylinders. With this engine the whole expansive force of very high pressure steam is used with a steady equal power, as the piston area increases in proportion as the pressure of steam is reduced. The engine is direct acting, has no fly wheel, as the cranks are at right angles, and only common slide valves. This engine carries out, it is believed, the expansion principle to its utmost extent, so that the saving of coals will be of importance.

*11. Patent Portable Engines, upon the "Forced Combustion Principle;" A. Chaplin and Co.

In this system the draught chimney is virtually abolished. Instead of hurrying away the gaseous products of the fuel, directly that they are developed by the heat of combustion, and giving no time for acting upon the flue surface of the boiler, the entire gaseous current in its attempt to escape is restrained and hindered, causing whatever comes from the furnace to be kept back and commingled with the flame and incandescent fuel therein. These engines are adapted for every description of work, and require neither building in nor fixing in any way. They are constructed to burn wood, or the cheapest kinds of coal.—See *Practical Mechanics' Journal*, Sept. 1st, 1855.



12, Combined-Trunk Double Expansive Marine Engine; Edward E. Allen, Assoc. Inst. C.E.

This invention is illustrated by a sectional working model, as also by a coloured drawing, showing the engine in section and plan; the latter also shows the arrangement of the feed and bilge pumps. Two cylinders are placed opposite to each other, and the steam first entering in the upper part of one cylinder presses upon the *annular* surface round the trunk. This being comparatively a small surface, it is cut off at any part of the stroke required, (by the ordinary slide valve, without the use of expansion gear,) and then is passed into the lower end of the same cylinder, where it is expanded to any extent required, this expansion being in the ratio of the annular surface to the whole area of the cylinder. During the time the steam is acting upon the annular surface, the lower part of the cylinder is open to an ordinary condenser, and while the steam is expanding in the lower part of the cylinder (on an effective area equal to the area of the trunk), a vacuum is maintained in the bottom of the *opposite* cylinder, this being placed on the other side of the main shaft. The two trunks of the opposite cylinders are firmly connected together by rods, so that they and the pistons move simultaneously; a single connecting rod is attached to one of the trunks in the ordinary way. Either one or two pairs of cylinders may be used; if the latter, the cranks would be set at right angles, as usual. The air pumps are shown as placed between the fore and aft pairs of cylinders, and are inclined towards the main shaft, being worked from a central crank. The feed and bilge pumps are also shown in the plan drawing, placed between the fore and aft pairs of cylinders, and are worked from eccentrics keyed on the main shaft. The condensers are placed underneath the air pumps. The position of all the pumps may be varied according to circumstances, but the arrangement shown renders the whole machinery compact and the parts easily accessible. The main features of this arrangement are—first, that the atmospheric pressure on the outer end of the trunks is counterbalanced, which, if not done, would prevent the steam being worked so expansively. It will be understood, from the foregoing description, that the steam constantly acts against a vacuum, thus allowing of any degree of expansion. Secondly, the steam when at its greatest pressure acts only upon a small surface, and does not act upon the whole area of the piston until it is partially expanded. The third point is, that the ordinary slide valve cuts off the steam at the required part of the stroke, the expansion nevertheless being carried out to six or eight times, according to the relative size of the trunks. The following gives a summary of the alleged advantages of this construction of engine:—1. Complete expansion with a short cylinder and without expansion gear. 2. Great compactness of arrangement, the floor space occupied being about one-third of a square foot per nominal horse-power. 3. Capability of working with high pressure steam, without the weight of machinery being proportioned to resist the pressure on a large area of piston. 4. Steam always acting against a vacuum. 5. Perfect uniformity in the amount of work done by the in and out strokes, the power being made up by the pressure of the initial steam on the annular surface of one cylinder, and the expanding steam on the trunk surface of the opposite cylinder. 6. The variation in the power of the engine at the two ends of the stroke is greatly diminished, the expansion taking place in two steps. Upon calculation, it will be found to be less than one-fourth of that of an ordinary single-cylinder engine working steam to the same degree of expansion. 7. Great economy of fuel, from the capability of using steam of a higher pressure, and working it or steam of the ordinary pressure more expansively than is practicable in engines as now constructed. The reduction in the quantity of fuel required may be from one to two-thirds of that now ordinarily consumed. —See a pamphlet, entitled "Economy in Working Steam Expansively in Marine Engines," by the Inventor: Hebert, Cheapside.

*13. Parallel-action Z-Crank Engines for Marine Propulsion; A. Morton and E. Hunt.

In these engines the cylinders are placed with their axes parallel to the propeller shaft, and their pistons work out longitudinally as regards the vessel. The cylinders are at the same time placed as close as is convenient to the shaft, and the additional space taken up by the details which communicate the motion to the latter, is scarcely more than equal to the length of the piston's stroke. Fig. 1 is an end elevation, Fig. 2 is a plan, and Fig. 3 is an oblique section, taken at an inclination of forty-five degress through one of the cylinders, through the shaft bearings, and through the air-pump on the opposite side.

Fig 1.

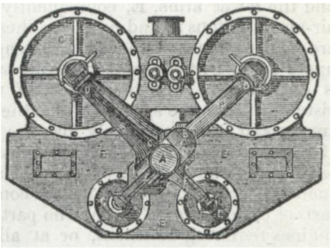
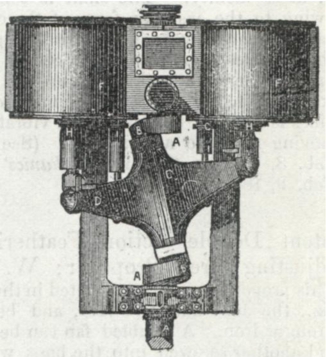
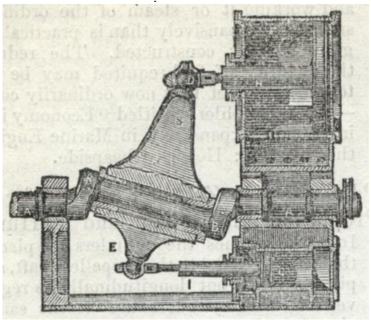


Fig 2.



The chief peculiarity of the arrangement is the form of the shaft, A, which has two cranks, B, forged upon it, nearly at right angles to its axis, whilst the elongated journal, which lies between and connects them, is inclined to, and crosses the axis of the shaft, in such a manner that the cranks, B, stand out from diametrically opposite points of the shaft, the whole being termed a Z-crank from its zigzag form. The exact shape of the Z-crank is best seen in Fig. 3, it being there represented as lying flat upon the plane of the section. Upon the inclined cross-piece of the Z-crank is placed a lever-piece, consisting of an elongated tubular boss, C, having four arms, D, D, E, E, standing out at right angles to the cross-piece and to each other. The two upper and longer arms, D, are jointed to the connecting rods of the two steam cylinders, F, whilst the lower and shorter

Fig 3.



arms, E, are similarly jointed to the connecting rods of the air-pumps, G. The combined action of the pistons on the Z-crank causes the shaft to rotate, one piston being at the most effective part of its stroke whilst the other is on the dead centre, as in common engines, where two steam pistons are connected to cranks at right angles to each other. The rotation of the Z-crank causes the ends of the lever-piece arms to reciprocate longitudinally as regards the shaft, A, and the lower arms, E, consequently work the air-pump pistons in and out. As these arms, E, are scarcely more than half the length of the upper arms, D, the stroke of the air-pump piston is considerably less than that of the steam pistons, so that the speed at which the air-pumps are worked is comparatively low, the advantage of which is well understood. Whilst the compactness of these engines is incontestible, this quality is not accompanied by any complexity of parts or other defect. There is no part about the engines requiring attention, or at all likely to need repairs which cannot be got at with the greatest facility. The shaft is self-balanced, owing to the peculiar form of the crank, and can consequently be driven at a higher speed than common engines, in which the heavy unbalanced cranks makes the motion irregular, and, in fact, the whole arrangement of the engines is such as to reduce the vibration of the moving parts to a minimum. (See *Engineer*, Feb. 8, 1856, p. 68, also *Mechanics' Magazine*, Feb. 9, 1856, p. 121.)

13*a*. Patent Double-action Feathering and Adjusting Screw Propeller; W. Hewitt.

This propellor can be constructed in three pieces, viz., the boss and two fans, and be made of wrought iron. A disabled fan can be removed, and another screwed into the boss, without removing the shaft or having to place the vessel in dock. The well or chamber for drawing the screw up out of the water, and the usual requisite machinery for effecting the same, are dispensed with. It can be adjusted and feathered from inside of the vessel. When the fans are set for work (say at an angle of 45°) the root or bottom of the same closes on the surface of the boss.

14. Patent Safety Valve for Steam Boilers; E. G. Cole.

(See *Mechanics' Magazine*, Dec., 1848.)

*15. Patent Steam Safety-Valve; P. Arrive.

This inventor claims—Firstly, the pile seating of rings, being the marginal annular rings which seat the valve lid, preferably having conformation to become compressed under steam upon the annular margin of top valve box; the said pile, excepting the upper marginal ring, which may or may not be electro-plated, being preferably flat rings of sterling silver sheet, or of metal electro-plated with silver, so as to become incorrodible. Secondly, the lifting apparatus in connexion, worked by the ascent of the valve lid attached to the seats, uplifting one or more, either along with the valve lid or subsequently to its rise, so that the action of rising of the seat or seats shall open the second thoroughfare or outlet for steam. Thirdly, the flexible disc, being the sheet or plate or plates of flexible metal, preferably composed of brass or necessarily of iron, which covers the annular opening when directly laid thereupon as the covering lid, or intermediately be employed to communicate movement to the lid when attached to it, and, as in the former instance, encloses fluid mercury whensoever applied to cover the annular opening, or to give movement to the safety-valve of steam engines.

16. Patent Annular Safety Valve; W. Hawthorn.

In practice the common mitre safety valves for steam boilers are found to lift to a very small extent for the escape of the steam, when the pressure in the boiler exceeds the load upon the valve. If the latter be continued uniform, and the pressure of steam increased, the lift of the valve-lid is not in accordance with the increase of pressure, and is in no case proportionate to the full area of the valve. This defective lifting of the valve-lid is found to arise from a partial vacuum being formed underneath it, by the radiating discharge of the steam forming an inverted cone, the interior of which is kept in a state of exhaustion by the rapid diverging streamlets as they issue from the circumference of the lid as soon as it is lifted from the valve face. The annular valve has been designed with the view of counteracting this defect. The centre part of the lid is removed and cast in one piece with the valve seat, so that as soon as the valve lid is lifted the steam can escape through the central part of it as well as past its external circumference, thus giving nearly double the amount of escape for the steam with the same lift as a common mitre safety valve of similar external diameter, and by using a greater number of rings with the same lift, the escapement may be increased to any required amount. These valves also possess the further advantage of requiring much less weight to load them to resist a given pressure. The valve faces are either made concave, and the lid of the form of the segment of a sphere, or they are made upon the same plane, so that the expansion of the metal by heat does not affect their bearings; and, by making the spindle or boss of the valve lid hollow, the valve is loaded by the weight pin below the level of the faces, thus giving to the valve lid a self-adjusting tendency, and not depending on the boss or pin as a guide, they have a perfectly free action in their sockets, whereby friction is avoided. Fig. 1 is a sectional elevation of an annular safety valve, with flat faces, *a a*. The spindle or boss, *b*, of the lid is hollow, to allow the weight pin, *c*, to pass down it. The valve is loaded by a lever, *d*, and spring balance, *e*, in the ordinary manner. Fig. 2 represents an elevation of a double annular

Fig. 1.

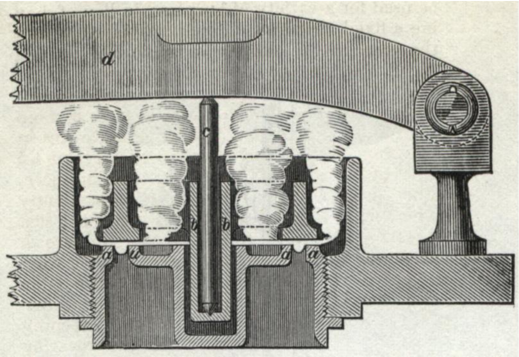
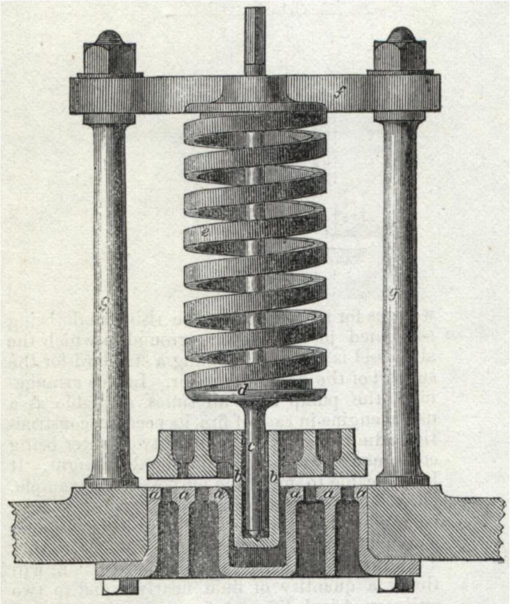
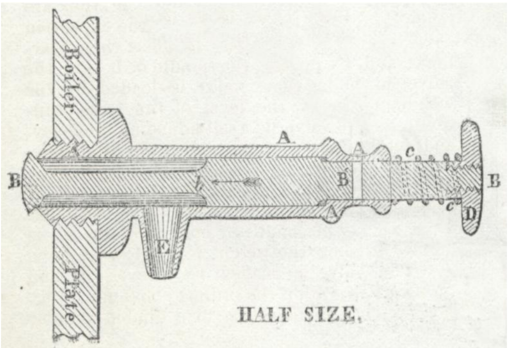


Fig. 2.



safety valve, with flat faces, *a a*, and hollow boss or spindle, *b*; the weight pin, *c*, has a collar, *d*, formed upon it to carry the spiral spring, *e*, which is compressed by the cross bar, *f*, and two lateral bolts, *g g*, to give the required load direct to the valve lid. [See *Practical Mechanics' Journal*, August, 1855, and Leslie's "Elements of Natural Philosophy," Note 9, page 458.]

17. Patent Improved Steam Guage Valve; I. Hicks.



This arrangement affixed to a steam boiler, serves to distinguish the respective positions of the water or steam; the valve being opened inwards, by manual pressure, allows the escape of the fluid, as the case may be, through the nozzle, and, on the pressure being withdrawn, the valve is restored to its normal position, either by the power of the steam or the tension of the spring. The advantages of the Patent Guage Valve over the ordinary guage cock, consist in simplicity, economy of labour and material, ready efficiency, and principle of self-adjustment. A A, brass or gun-metal cylinder, screwing into boiler-plate; B B, ditto ditto, valve and spindle; C, spiral spring, to secure adjustment; D, milled head; E, nozzle.

18. Patent Guages for indicating the pressure of steam, gas, water, and other fluids, and the amount of vacuum in condensers, &c.; Gwynne and Co.

18*a*. Patent Steam Pressure Guage; Shanks and Co.

This steam pressure guage somewhat resembles the thermometer in external appearance, but its principle of action is altogether dissimilar, being wholly independent of heat or cold; it is simply hydrostatic pressure acted on by the steam, depressing the elastic sides of a flattened glass bulb, and forcing the mercury to ascend the tube and scale. The employment of glass, as an elastic medium, gives an accuracy to the indications of this instrument hitherto unattainable, that material being permanently elastic under all changes of temperature and pressure and not subject to changes by oxidation, &c.

19. Patent Equilibrium Pressure Gauge; Thomas Rickett.

In this gauge two or more pistons or discs, of different diameters, are combined. The small piston is exposed to the pressure of steam or other fluid, and the larger piston to that of mercury, the pressure of the column of mercury on the large area of piston balancing the high pressure of steam on the small area of piston, and the height of the mercurial column indicates the pressure; thus depending simply upon pressure, and not in any way upon the elasticity of steel or other material, it is not subject to variation, and can be made to indicate any pressure from simple calculation. The pistons work perfectly free, as they have no bearing surface, and their motion is quite inappreciable. (See the *Artizan* for February, 1856.)

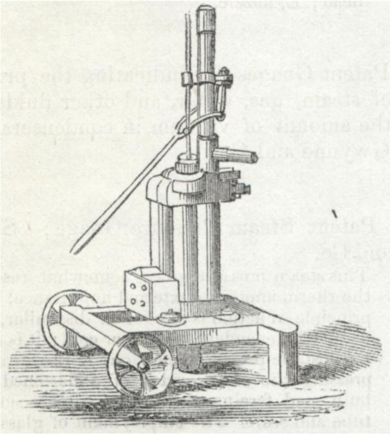
20. Spring Governor (for an 8-horse engine), provisionally registered; W. I. Simons.

As this governor may be used either vertically, horizontally, or obliquely, a direct action can at all times be obtained, and, consequently, levers and cranks altogether avoided. By increasing the weight or number of the balls and springs, the power will be increased in the same ratio. This kind of governor, on account of its great simplicity, can be applied at about one-third of the cost of those in ordinary use.

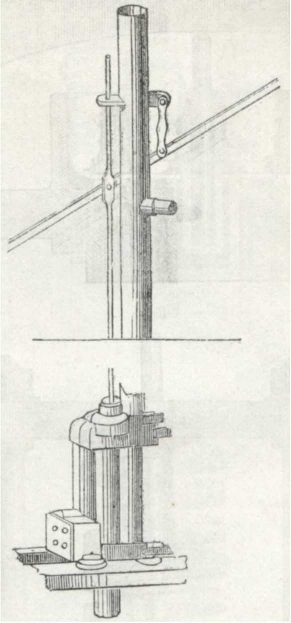
21. Patent Steam Engine Counter and Clock; A. P. How.

This counter is for registering the number of revolutions made by an engine or other mechanism. It may be used for ascertaining the duty of pumping engines and water wheels, the revolutions on board a steam vessel, to calculate the slip of the propeller, and in a locomotive to test the slip of the wheels. It may also be used to indicate the distance travelled by a carriage. These counters may be had in combination with a clock.

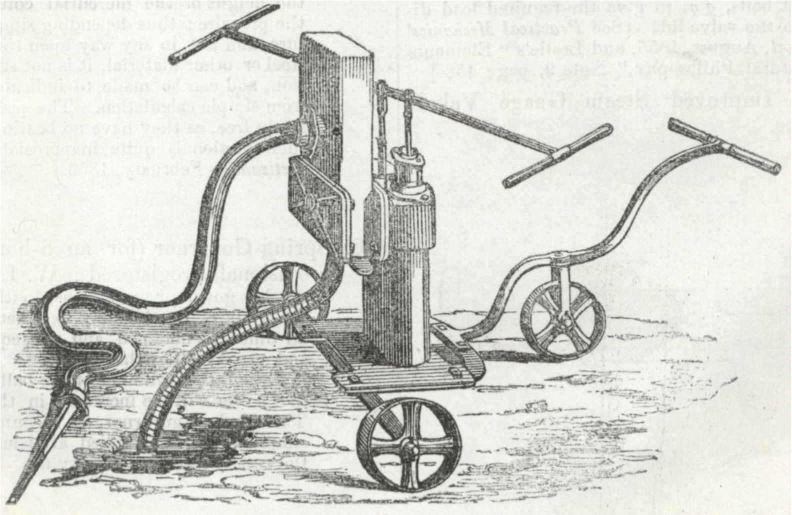
22. Patent Double-Action Lift and Force Pump; T. A. Cooling.

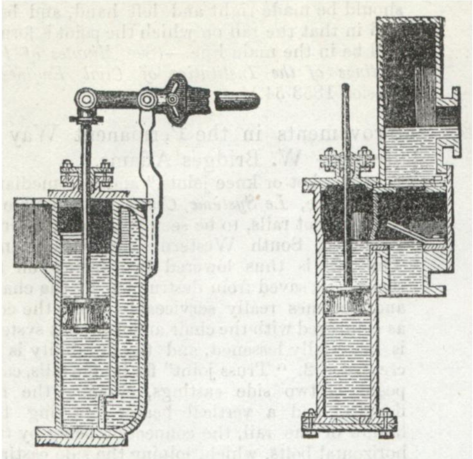


In the construction of this pump the patentee has endeavoured to keep in view the following objects:—Economy of manufacture, simplicity of construction, reduction of labour in working, and moderate cost to the purchaser. The pump is double-action, and the body or lower part is cast in one piece, at the same time affording easy access to the valve-boxes, the covers and clacks of which are readily removed for the purposes of examination or repair. The handle, or lever, is supported by a mechanical arrangement, which renders it easier to work than the ordinary form. These pumps are fitted to a strong frame, to which two wheels are adapted, so as to be easily removed from place to place, like an ordinary sack barrow. By this arrangement the pump may be used for a variety of purposes, in lieu of having a fixed pump at different places, as is now the case. It is equally as applicable to deep wells as for surface water, the rising main being continued just above the ground to which the air vessel is attached, forming a standard for the support of the handle, or lever. In this arrangement the pump is at all times available as a useful engine in case of fire, its peculiar construction admitting of a large quantity of water being continuously forced to a considerable height. It is applicable to maritime purposes, for example, either for bilge or midship pumps, where it may be rendered useful for extinguishing fire. It is stated to have been proved by experiments that a pump of 2¼in. barrel, of this construction, will throw a quantity of fluid nearly equal to two ordinary 4-inch lift and force pumps, *i.e.*, equal to 700 gallons per hour, at about one-fourth of the ordinary outlay, and one-half the cost of labour.



23. Patent Portable Fire Engine and Irrigating Pump; S. Holman. Exhibited by B. Fowler & Co.





In this pump a continuous supply is obtained from one barrel. By the removal of a single plate access is permitted to all the valves simultaneously. This arrangement renders the usual mode of disconnecting pipes unnecessary. All the valves are out of the barrel, which permits their areas to equal that of the piston, and the water passages to be proportionately large. The hand-lever of this pump is made to vibrate on a fixed fulcrum pin and a guide pin, having slots in it equal to the versed sine of the arc which the lever, if worked on a fixed point, would describe. This mechanical arrangement supersedes various expensive modes hitherto adopted to effect a parallel motion, and is applicable to the guiding of reciprocating rods generally.

*24. Outside-cylinder Tank Locomotive; Neilson and Co. Exhibited by W. and J. H. Johnson.

Fig. 1 is a side elevation; Fig. 2 is a plan, half in horizontal section; and Figs. 3 and 4 are end elevations, partly in transverse vertical section, of this locomotive, which comprehends various novelties of arrangement. Such a disposition of parts has been aimed at in the construction of this engine as will ensure steadiness at high speeds—whilst at the same time a more than ordinarily convenient arrangement of valve gear has been adopted, and the boiler is constructed with increased steam-room. The front part of the locomotive is carried on two pairs of wheels having outside bearings in a bogie frame, connected to the framing by a swivelling centre. The driving axle is behind the fire-box, and the valve link-motion details are placed to the rear of the axle, beneath the footplate, in a position where they can be easily examined by the engine driver, and lubricated even whilst the locomotive is running if necessary. Each link acts on a downward projecting lever upon a short weigh shaft, a lever projecting up from which is jointed directly to the valve rod, made in part of wrought iron tubing, for the sake of lightness. The cylinders are placed at about the middle of the boiler's length, and the valve casings are on the topsides of the cylinders—everything being most conveniently accessible—and the steam communication from the regulator short and direct. The increased steam space in the boiler is gained by composing the boiler's transverse sectional outline of large portions of two circles. At the junction lines of the two circles a strong horizontal diaphragm plate is fixed across the whole length of the boiler—and this is perforated, for the free passage through it of the steam. The locomotive represented in the drawings is of the "tank" class, and is designed for running express trains distances of thirty to forty miles. The various improvements comprehended in this arrangement are, however, equally applicable to ordinary separate-tender engines. The cylinders are 16 inches diameter, 21 inches stroke; driving wheels 7 feet diameter; contents of tank, 1,150 gallons.

*25. Outside-cylinder Goods Locomotive; Neilson and Co. Exhibited by W. and J. H. Johnson.

The two views of this engine are a side elevation and a half plan. In this engine the framing is built independently of the boiler, and the whole is fixed together so as to facilitate the taking to pieces of any separate portion for repairs without interfering with other parts not needing repairs. The cylinders are placed well forward, to obtain a good distribution of the weight upon the wheels. The parallel boiler is simple in construction, whilst it is stronger, more durable, and more easily repaired than when formed with the raised external fire and smoke boxes. The trailing or hind wheels have outside bearings, and each driving wheel is balanced. The steam cylinders are 16 inches in diameter, with a stroke of 22 inches. The four coupled driving wheels are 5 feet in diameter, and the trailing wheels are 3 feet 6 inches in diameter. The side valve gear and link motion details are arranged in a simple manner, and the connections being direct there is little liability to derangement. The feed pumps are actuated by the piston rod clutch, which plan is preferable to the use of an eccentric movement underneath the boiler. The pumps are in an accessible position for the examination of their valves, and the manner of fixing them is simple. Engines of this construction are in operation on the Edinburgh and Glasgow and Caledonian Railways. (See *Practical Mechanics' Journal*, vol. viii., p. 264, March, 1856.)

26. Patent Compensating Wedges; — Hughes. Exhibited by J. J. Capper.

In locomotive engines, as is well known, the cylinders, after being in use for some time, become worn to a barrel shape, internally, by the action of the piston. This is owing to the angular action of the connecting rod, which is insufficiently counteracted by the guides in which the piston-rod cross-head works; these guides, or the cross-head slides, becoming gradually worn, and so allowing of play. Several expedients have been tried for compensating for this wear of the slides and guides, but without success, chiefly on account of requiring to be adjusted by a skilled mechanic. This compensating contrivance can be adjusted at any time by the engineman. This system of compensating wedges is applicable to all engines and other machines, where wear is produced by surfaces rubbing on one another by a rectilinear movement, and will be found beneficial in engines, whether locomotive, stationary, or portable, which are driven at quick speeds. (See *Practical Mechanics' Journal.*)

27. Patent Flexible Joint for Locomotive Feed Pipes; E. Lund. Exhibited by T. T. Lingard.

This is a joint in which the elasticity of india-rubber, under compression, is taken advantage of. Instead of using a ball and socket joint, and a telescope tube for the movement of the feed pipe, three joints, packed with india-rubber, so as to admit of freedom of action, are used; these are placed in the same positions as the joints of the human arm, so that motion may be obtained in any required direction. The construction of the joints is such that leakage is impossible, and the durability of the india-rubber is not known, the oldest joints made having been regularly at work more than six months, and purposely subjected to the most severe tests, on one of the engines of the Lancashire and Yorkshire Railway, without the slightest deterioration.

*28. Wrought Iron Fish-Chair; A. S. Jee.

This chair is formed by the rolling of wrought iron, of the section shown in the drawing, in any convenient length, which is then cut into pieces 15 inches long each, two of which being bolted on to the rails at the joint, and meeting underneath the bottom of the rail, form the fished chair. This principle is applicable to any section of rail.

29. Patent Railway Crossing; H. Carr.

The crossings hitherto used on railways, not having been found to withstand heavy traffic satisfactorily, an attempt has been made to strengthen the common crossing so as to obviate its acknowledged defects. These are—first, the cutting of the wing rails where the edge of the wheel first catches them; secondly, the crushing of the point; and thirdly, the want of hold or connection between the point and the B and C chairs, which allows the point to work. The first and second objections are obviated by strengthening the wing and point rails with filling pieces welded to the rails throughout such parts as receive the weight of the wheels on the overhanging flange. The third objection to the common crossing is removed by making one of the blocks forming the distance piece between the wing rail and point loose, or, at all events, not, as is usually the case, attached to the chair; one of the keys thus tightens up a wing rail, the loose block, and the point, against the block which is cast on the chair. If the point be made the same, top and bottom, and the tilt be not given either to the point or wing rails, then the whole crossing may be turned when worn out on one side; when thus made a strong bolt is required to connect the point rails immediately behind the B chair. The bolt should be 1½ inches in diameter, tapped into the filled part of one rail, to avoid the necessity of having a nut. The steeling the crossings has no particular connection with the present improvements, but it is strongly recommended, and should be done thoroughly well; if insufficiently welded or laid on too thin it will inevitably chip or tear off. One most important point in switches and crossings is, that the general construction of the main line should be preserved throughout; that the same description of rail, sleeper, and fastening should be employed universally, with such alterations and additions only as are requisite to form the switch or crossing—the change from one kind of rail to another is always bad and difficult to keep in order. The crossings should be made right and left hand, and be so laid in that the rail on which the point is formed will be in the main line.—(See *Minutes of Proceedings of the Institution of Civil Engineers;* Session 1853-54.)

30. Improvements in the Permanent Way of Railways; W. Bridges Adams.

1. "Bracket or knee joints," and intermediates, (in France, *Le Système Console*), for double T rails, or foot rails, to be seen in use on the Great Northern, South Western, and other lines. The rail is thus lowered two inches on the sleeper, is saved from destruction in the chairs, and becomes really serviceable, while the cost, as compared with the chair and fish-joint system, is materially lessened, and the durability is increased. 2. "Truss joint" for bridge rails, composed of two side castings, clipping the rail flanges, and a vertical bearer entering the hollow of the rail, the connection being by two horizontal bolts, which, joining the side castings along the two angles of the vertical bearer, render the two rails practically a continuous bar. In use on the Great Southern of Ireland, on the South Eastern, South Western, Brighton, and other lines. 3. "Sample section of the suspended girder rail," with angle brackets and portions of tie-bar attached. The tread or surface of the rail is only 2½ inches above the trough of ballast, which is 1 ft. 1 in. wide, while the heel below is 4½in. Every portion is wrought iron; the types or parts being four in number—rail, bracket, bolt and tie-bar. To be seen in use on the Great Northern Railway, at the goods station, Maiden-lane, under the daily heavy traffic of the up coal line.

30*a*. Patent Rail for Railways; H. H. Henson.

This rail is somewhat conical in section, and has an expanding base. It is proposed to be used on the longitudinal sleeper system.

31. Greaves' Patent Surface Packed Railway Sleepers, with Patent Fish Joints; Permanent Way and Greaves' Patent Sleeper Company.

These sleepers are used on many railways in this country, in India, South America, Spain, the Alexandria and Cairo Railway, Egypt, and are now in course of manufacture for the Cairo and Suez Railway.

32. Patent Improvements in Laying Rails, Chairs, and Sleepers for the Permanent Way of Railways; J. C. Brant. Exhibited by F. Haines and Co.

The chair for fixing the rails is sunk into the sleeper, so as to allow the under portion of the rail to obtain a safe and permanent bearing on the sleeper. A flat piece of cork is inserted between the rail and chair, thus preventing noise and the biting of the rail into the chair. The chairs are fixed to the sleepers, by screw-bolts and nuts, in lieu of the old method of driving bolt-nails, by which splitting of the sleeper, injury to the chair, or displacement of the sleeper is prevented; the chairs are also easily removed when required.

32*a*. Railway Buffing and Drawing Apparatus; E. D. Chattaway. Exhibited by W. and J. H. Johnson.

In this contrivance the buffer and draw hook are combined in one piece or arrangement, and the buffer head, instead of being a plain circular disc, is made of an irregular form, the lower portion being curvilinear, whilst the upper part is a long narrow projection. The inner side of this projection is shaped to act as a draw hook, for the reception of the coupling link of the adjoining carriage, which, being made wide for the purpose, works upon it as upon an ordinary draw hook. The draw and buffer rod is made with a screw thread near its end, just within the buffer head, and carries an adjustable nut and collar apparatus with projecting arms, carrying a wide coupling link. In this way the coupling can be drawn hard up or slackened off, as occasion may require. Fig. 1 is a side elevation of the ends of a carriage and a goods van, and Fig. 2 is a plan corresponding, showing the application of the central drawing and buffing apparatus. Fig. 3 is a face-view of the buffer head and coupling link detached. There is an average saving of about 40 per cent. in cost, and of about 60 per cent. in weight, with this coupling apparatus, as compared with the various systems at present in use. (See *Practical Mechanics' Journal*, vol. viii., p. 175, November, 1855.)

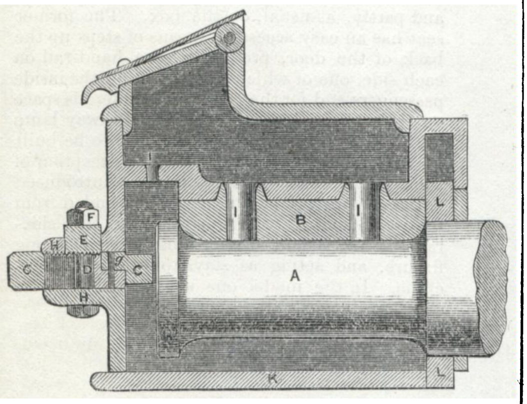
33. Patent Railway Buffer; Sharp, Stewart and Co.

33*a*. Pneumatic Buffer; Exhibited by Stansbury and Pitman.

34. Patent Method of Stopping Railway Trains; I. Raywood. Exhibited by F. Haines & Co.

This invention consists in the application of steam to a piston, the rod of which works break-blocks on each side of the wheels.

35. Patent Railway Axle Boxes and Bearings, for preventing oscillation in Railway Carriages and Engines; —Barran. Exhibited by R. and T. Hughes.



The object of the adjustable part of this invention is to keep the axles of engines and carriages from getting end-play in the journals, and swerving sideways,—to keep the carriage steady on the axle,—to keep the axle-bearings always right, instead of gradually wearing away and getting wrong,—and to prevent the oscillation which gradually more or less arises from such wear, and to prevent the necessity of taking out and changing the bearings for that purpose. These improvements consist of an end-bearing piece of different constructions, to suit the various circumstances of engines and carriages, which is adjusted nearly to touch the end of the axle, and to prevent end-play in the journals; and of a grit-shield, to prevent grit or dirt getting on the journal. This invention is illustrated by a series of certificated specimens of axle-bearings, taken from engines and carriages which have been in use from three to fourteen months, and have run from 24,500 to nearly 50,000 miles.

36. Patent for the Prevention of Railway Accidents; H. Kaye and P. Burrell.

36*a*. Patent Covered Railway Goods Waggon; H. H. Henson.

The sides, ends, and roofs of these waggons may be either of flat sheet iron, corrugated iron, or wood and iron; with inside rolling or outside folding doors, at either or both the sides, forming an opening of six feet wide, or of such other dimensions as may be considered desirable. Any part of the roof may be made to roll back, exactly over the door space; moving transversely upon the fixed portion of the roof, rather more than half the width of the waggon, so as to allow the crane chain to deposit or abstract its load from any part of the interior. One man is able to open and close the waggon. The doors and moveable part of the roof are made secure by a bolt and self-acting spring-lock.

37. Patent Compensating Carriage Spring; G. N. Hooper. Exhibited by Hooper and Co.

The object of this invention is to give an easy movement to carriages, whether carrying a part only or the whole weight they are built to carry. Up to the present time, it has been necessary in building carriages to make the springs at once strong enough to bear the extreme weight the carriage is intended to carry, so that when the carriage carries one person, or only part of its maximum load, the springs are not brought into their proper action, and the movement of the carriage is rough and uneasy. By this construction, the steel springs are made one-third the usual weight, but are so supported by the springs of india rubber (of various sizes), that when loads of varying weights are carried, such springs only are brought into use as are required to carry the weight imposed on them, thus rendering the spring easy under any condition of load. They have a further advantage of lightness. The same principle of india-rubber springs, of various sizes and strength, is applicable to railway carriages, carts, waggons, public carriages, and spring cushions and squabs. This spring now carries nearly 120lbs. It has been tested with a weight of 400lbs., and with that load only closed 2½ inches, it is consequently too strong for an ordinary brougham carriage. The old india rubber springs shown have been in constant use nearly four years on a carriage suspended only on india rubber springs, without steel springs; though they have lost somewhat of their elasticity, they are not worn out or dangerous, and can be replaced at a much less expense than leather braces.

*38. Plans of various modes of making and applying Hooper's Patent Compensating Springs; Hooper and Co.

*39. Eight Improved Photographic Perspective Representations of Carriages; Hooper and Co.

40. An Improved Bolt Fastening for Carriage and other Doors; Hooper and Co.

The bolt has a rack on the upper side, and is acted on by a cog wheel, turned by a lever handle.

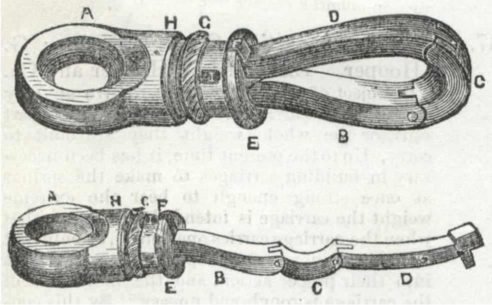
41. Patent India-rubber Springs, for Carriages of all descriptions; W. C. Fuller.

No. 1. Full size cart or waggon spring. No. 2. Frame with lever and ball, showing suspension spring. No. 3. Hand model of India-rubber suspension spring as applied to phætons. No. 4. Full size suspension spring, covered with leather. No. 5. Ditto ditto, uncovered. No. 6. Ditto ditto, Brougham spring. No. 7. Iron check spring. No. 8. Gun metal ditto. No. 9. Shackle for connecting steel springs. No. 10. Suspension shackle. No. 11. Mortar ring. No. 12. Lithograph plate.

41*a*. Specimens of Tyre Irons for Carriages; H. and A. Holmes.

These tyres are designed to protect the felloes, reduce the weight, and lessen the draught of carriages.

42. Patent Universal Safety Hook; C. Hunt.



A is the part of the hook, which is also made with a swivel screw or otherwise, by which the hook is attached to the part required.—B is the stem which runs from A, and is pinjointed to the semicircular part C, which is also pinjointed to the part D—at the end of which is a catch—E is an iron rim, round the stem B, with a slot at F, through which the catch at the end of the part D passes, and drops into a square hole in the stem B.—G is a brass collar with a projection at one end, and turns round the stem B between the rims E and H.—Under the brass collar or behind it is a spring which presses it against the rim E, in which rim, at a short distance from each other, are two niches, in one of which the projection in the collar G is pressed when the hook is shut, and in the other when open, to secure the collar from turning round.—I is a slot in the brass collar G, which admits of the part D being brought through to secure the hook, and also of being liberated when required.

43. Oval Omnibus; T. Tucker.

In this omnibus there would be more seats and leg room than usual. Its length would be 21 inches less, and its greatest width about 6 inches in excess of those now running. The well would be much deeper, but would be contracted in front, so as to have a straight bed and high fore-wheels. The seat on the roof of the oval omnibus would accommodate nine persons.

44. Registered Improved Omnibus; T. Wallis.

45. Improved Cab Omnibus; J. H. Walsh.

The object of this improvement is to give increased accommodation to that afforded by the vehicles in common use, whilst, at the same time, the weight and price are the same, or very nearly so. This is mainly effected by the arrangement of the seats in such a way that the knees and legs of each passenger are lodged under the seat of the one next before him. In order to obtain this economy of space, there must be a rise of twenty-four inches from the back to the front of the omnibus, equivalent to the thickness of the knees of four persons; this gives eight commodious chairs, with or without arms, each being 18 inches wide, with ample leg-room. Four other persons are accommodated in a separate compartment, forming a semicircle, with their backs to the horses. Each of the eight has a window at his own command, whilst the four others are provided with only two windows, but have plenty of ventilation. The gangway being clear of legs, every passenger can reach his seat with facility, and when there, is at his ease, and free from all danger from pickpockets. The outside passengers are located partly in a sociable, behind, which may be made to hold seven, eight, or nine persons, and partly, as usual, on the box. The former seat has an easy access by means of steps up the back of the door, protected by a hand-rail on each side, one of which serves also for the inside passengers and for the conductor. There is space on the roof for luggage, and for a railway lamp by night. The omnibus is proposed to be built of the ordinary materials, with the exception of the chairs, in which perforated zinc is introduced with economy; they are partly suspended from the roof, and partly supported by the side-rails and the bottom, forming a very strong fixture, and acting as stays to the whole machine. In the model one side is removed, to show the internal arrangements.

46. Saloon Omnibus; J. Ward.

MANUFACTURING MACHINES AND TOOLS.

*47*a*. Slotting and Shaping Machine; G. and A. Harvey. Exhibited by W. and J. H. Johnson.

The general contour of this machine and the distribution of metal in its framing, are such as to secure the highest available degree of strength with a determined mass and weight of material. The great distance between the bearings of the slotting bar, gives a correspondingly superior steadiness to the cut—a point of the highest importance as affecting the accuracy of the pared surface, and the consequent value of the work performed. Motion is communicated to the slotting bar through a connecting rod, of a length much greater than is ordinarily found in such tools. The gearing involves a pair of elliptic wheels, the effect of which is to confer additional power upon the cut—and a saving of time by the increased speed of the return stroke. This machine received a prize medal at the Paris Exhibition. (See *Practical Mechanics' Journal*, vol. viii., p. 6, April, 1855.)

*47*b*. Marine Compasses, with adjustable corrective magnets; A. Small. Exhibited by W. and J. H. Johnson.

In the modification represented in Figs. 1, 2, and 3, the binnacle case, A, is constructed as usual, to receive the compass contained in the cylindrical case, B. The fore-and-aft adjusting magnet is at E, and the athwart-ship adjusting magnet is at F. These magnets are encased in brass, and fitted to slide in guides, J, being adjusted by means of screw spindles, whilst their positions are indicated by graduated scales. The top of the compass case carries a semi-circular scale, L, before which is suspended a little index pendulum, M, to point out the transverse inclination of the vessel, and thereby to enable the officer of the ship to make the requisite adjustment of the magnets. The case N carries a "dumb compass card" swung on centres, O, athwart ship only, and arranged to be set round, and when it is to be used it is adjusted to agree with the real card beneath. This being done, the vertical sight apparatus, P Q, is put into use to obtain the sun's azimuth, and thereby ascertain the actual magnetic compass-needle deflection. In the modification delineated in Figs. 4, 5, and 6, there are four corrective magnets, A, B, C, D, two being set near the top and two near the bottom of the case, the compass, E, being placed at about the centre of the case. A dumb card, J, is here fitted up as in the former example, and on the centre stud of this card is a horizontal arm, the ends of which indicate north and south. The moveable centre of the dumb card carries a segmental or semi-circular scale, K, indicating the latitude. This scale carries an adjustable slide-piece, L, having a vernier thereon, and forming the support of a complete circular scale, M, graduated to hours. This ring, M, has upon it a diametrical bar, supporting a central stile, N. This apparatus is most convenient and effective for showing at once the actual error of the compass-needle. (See *Practical Mechanics Journal*, vol. viii., p. 149, October, 1855.)

*47*c*. Brick, Tube, and Tile Machine; H. Chamberlain. Exhibited by W. and J. H. Johnson.

This machine consists of a horizontal pug mill, into which the raw clay is fed, and by which the plastic material is forced through a mouth-piece or brick die, the exuding stream of clay being seized by four rollers, combined so as to form the clay into a rectangular block. This rectangular stream is passed forward to a vertical-action wire-cutting apparatus, which severs the clay into the proper brick lengths. The die or mouth-piece through which the clay passes has rounded corners, and sharp square corners are formed by the subsequent compressing of the rollers. In this manner the inventor has surmounted the difficulty commonly experienced in producing a brick with well-defined edges by the unaided action of a sharp-cornered die. This machine turns out 20,000 bricks per day. (See *Practical Mechanics' Journal*, vol. viii., p. 220, January, 1856.)

*47*d*. Smokeless Steam Boiler Furnaces; W. S. Young. Exhibited by W. and J. H. Johnson.

This invention is applicable to most kinds of steam boiler furnaces, being, however, better adapted for internal fires. Under one modification two furnaces are employed for each boiler, the two being made to communicate with a single smoke chamber at their inner ends. The two furnaces are fired alternately, so that the thick, green smoke, produced from the freshly applied coals in one, may be commingled with the highly-heated smokeless products of the other. The smoke, or combustion chamber, is supplied with heated air by means of pipes passing through the water spaces. In marine boilers, where more than two furnaces are employed, the furnaces are connected to smoke or combustion chambers, in couples. Figs. 1 and 2 show the application of the system to an internally-fired stationary boiler, whilst Figs. 3, 4, and 5 represent a marine boiler similarly arranged. (See *Practical Mechanics' Journal*, vol. viii., p. 245, February, 1856.)

*47*e*. Improvements in Locomotives; J. E. M'Connell. Exhibited by W. and J. H. Johnson.

Fig. 1 is a transverse vertical section through the centre of a locomotive engine smoke-box, fitted with a feed water-heating blast-pipe. Fig. 2 is a longitudinal section corresponding, showing also the arrangement of feed water-pipes and clack valve-boxes connected therewith, as well as a differential flue tube contrivance. Fig. 3 is a vertical, and Fig. 4 a horizontal section of the blast pipe water-heater; and Figs. 5 and 6 are horizontal sections of two other modifications of this heating arrangement. Fig. 7 is a face view of a portion of the smoke box tube plate, showing the mode of attaching the flue tubes; and Fig. 8 is a longitudinal section of two varieties of the differential or sectional tube lengths, as fitted into their places. Fig. 9 is a small face view of the locomotive engine piston, a part being broken away to exhibit the packing details; and Fig. 10 is a longitudinal section of the piston with its solid rod. The feed water heating improvements involve the adaptation of a chamber of tubes, or alternate steam and water spaces, disposed between the steam cylinders and the escape passage to the chimney, in order to heat the water on its way to the boiler by means of the caloric of the waste steam and of the escaping gases in the smoke box. In the new arrangement of boiler tubes, each individual tube is made up of two lengths of different diameters, or bores, the large diameter being next the fire box. With this contrivance the heated current passing off from the fire-box is partially retarded in its escape to the chimney, thus imparting its heat more effectively upon the reduced bore. The improvement in pistons refers to a solid wrought iron or steel piston and piston rod, forged in one piece. This piston has either a single or double packing ring inserted into its edge, without any attached cover plate, the adjustment of the packing being effected by set screws. (See *Practical Mechanics' Journal*, vol. viii., p. 126, September, 1855.)

*48*a*. Advance-Bladed Conoidal Screw-Propellors; E. Hunt. Exhibited by W. and J. H. Johnson.

In these screws the outer and more efficient portions of the blades are thrown in advance of the central portions, so as to act upon the water in its solid or unbroken state, and before the central part reaches and disturbs it. The four varieties of screws shown exhibit the application of different curves, as the helical generatrices of the blades, for the purpose of giving to them a greater or less backward inclination, with the view of still further improving their efficiency. (See *Practical Mechanics' Journal*, vol. viii , p. 200, December, 1855; also *Mechanics' Magazine* for January 26th, 1856.)

*48*b*. Combined Horse and Steam Cultivator; R. Romaine. Exhibited by W. and J. H. Johnson.

Fig. 1 is a side elevation, and Fig. 2 is a plan of this machine. The steam boiler, engines, and working details are arranged on a light carriage framing, carried upon wheels, the rims of the wheels being made broad, to prevent sinking into the ground. The engines consist of two small oscillating cylinders, disposed transversely, one before the other, in the centre, between the frame plates and in front of the boiler. The piston rods pass out in opposite directions, and work two longitudinally disposed shafts, which, by means of bevil wheels on their lower ends, drive the digger cylinder, P. This cylinder has, fixed upon its periphery, three sets of radial arms, carrying a series of double inclined edged blades, R. The cylinder rotates at considerable velocity, and as the machine slowly traverses, the earth is thoroughly reduced, broken up, and disintegrated. A seed box is fitted up behind the cylinder, and the machine is capable of preparing the ground and of depositing the seed at the same time. This machine will do the work heretofore performed by the plough, subsoil plough, harrow, and sowing machine at one operation, and in much less time than it occupies at present. (See *Practical Mechanics' Journal*, vol. viii., p. 74, July, 1855.)

*48*c*. Water Meter; T. Kennedy. Exhibited by W. and J. H. Johnson.

Fig. 1 is a front elevation of the meter; Fig. 2 is a side elevation, with the casing removed to show the internal mechanism, and with the measuring cylinder in vertical section. Fig. 3 is a front elevation of the upper part of the apparatus, but with the counting mechanism and front plate removed, to show the details by which the valve or cock is worked. Fig. 4 is a plan of the apparatus with the covering casing removed, and Figs. 5 and 6 are vertical and horizontal sections through the waterways and cock. The actual piston stroke of this meter determines the quantity of water passing through the cylinder. No matter at what rate the water flows through, the indications will be unvaryingly accurate, as, should the piston exceed or fall short of its intended movement, that departure from the true action will be duly measured by the indicating mechanism. (See *Practical Mechanics' Journal*, vol. viii., p. 199, December, 1855.)

*48*d*. Self-acting Yarn-winding Machine; G. A. Cox. Exhibited by W. and J. H. Johnson.

In this machine the pirn spindles are of iron or steel, covered with leather, gutta percha, or some such elastic material as will answer the frictional requirements of this system of driving. Each spindle is disposed horizontally, and so that its internal covering is in frictional contact with surface wheels beneath, the latter being carried upon horizontal spindles set at right angles with the main centre shaft, from which the surface wheels are driven parallel with the spindles themselves. When the cop or pirn has been filled with yarn by the winding action, it stops automatically, and without any extraneous attention. This movement is produced by the pressure of the spindle end against a lever, which disengages a duly-arranged catch, and permits a pair of eccentrics or cams, situated beneath the spindle, to disengage the frictional surfaces, lifting the spindle clear of its driving discs or wheels. Several of these machines are in operation, and have given most satisfactory results. (See *Practical Mechanics' Journal*, vol. viii., p. 51, June, 1855.)

*48*e*. Traversing Cross-cut Circular Sawing Machine; J. McDowall. Exhibited by W. and J. H. Johnson.

This machine has been erected at the Royal Arsenal, Woolwich. The saw disc is nearly seven feet in diameter, and is one solid piece of cast steel. Its spindle is unconnected with the actuating power which communicates motion to the saw disc, through a couple of frictional cones embracing the saw disc, one on each side, and rotating in concert at a high rate. The saw is carried upon a travelling carriage, being mounted in bearings on the end of a long curved beam, capable of being adjusted upon centres upon the carriage, so as to elevate or depress the saw. The actuating power is transmitted to the saw by an endless belt, extending across the whole width of the house, along the bed-plate, being supported by double rows of loose carrying pulleys, and directed over the pulley of the central driving spindle by two guide pulleys upon the saw carriage. A 3ft. log can be cut through by this machine in 50 seconds. The objects looked to in this arrangement are, rapidity of action, the saving of manual labour in lifting heavy timbers to a separate saw for cross-cutting them, and the economy of space within the premises. (See *Practical Mechanics' Journal* vol. viii., p. 223, January, 1856.)

*48*f*. Stationary Cross-cut Sawing Machine; J. McDowall. Exhibited by W. and J. H. Johnson.

This machine has also been erected at the Royal Arsenal, Woolwich. Fig. 1 is a front elevation of this sawing apparatus, as in the act of severing a log. Figs. 2 and 3 are opposite edge views corresponding. In this machine the saw-blade is stretched, by means of flexible steel belts upon two pulleys, and a reciprocating motion is imparted to it by means of a crank arm on the spindle of one of the pulleys, this crank arm being linked by a long connecting rod to a smaller crank upon a rotating shaft driven by means of a belt pulley. The pulleys round which the saw belts are stretched are carried in frames arranged to slide upon the standards of the stationary framing. These frames are set up or down by means of racks and pinions, worked by hand, being counterbalanced by weighted levers, to which levers they are linked. As the sawing action goes on, the pulleys and frames are caused to gradually descend until the log is cut through. (See *Practical Mechanics' Journal*, vol. viii., p. 247, February, 1856.)

*48*g*. Steam Hammer, with Balanced Valve; R. Wilson. Exhibited by W. and J. H. Johnson.

*49. Sliding and Screw-cutting Lathe; Sharp Stewart and Co.

*50. Break-bed or Gap Lathe; Sharp, Stewart and Co.

*51. Portable Curvilinear Shearing Machine with revolving Cutters; Sharp, Stewart and Co.

*52. Planing Machine; Sharp, Stewart and Co.

*53. Slotting or Key Grooving Machine; Sharp, Stewart and Co.

*54. Double Wheel Turning Lathe; Sharp, Stewart and Co.

*55. Self-Acting Shaping Machine, with revolving Cutters; Sharp, Stewart and Co.

*56. Punching and Shearing Machine; Sharp, Stewart and Co.

*57. Self-Acting Shaping Machine; Sharp, Stewart and Co.

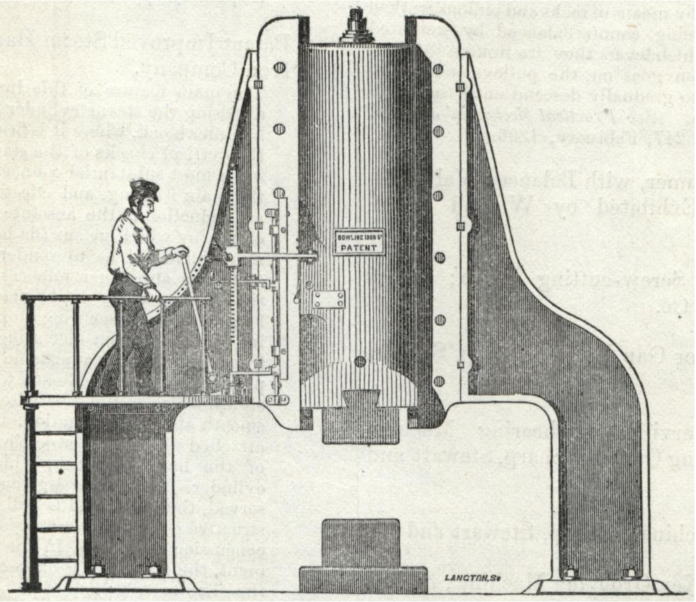
*58. Powerful Bar Cutting and Shearing Machine; Sharp, Stewart and Co.

*59. Compressed Air Forge Hammer; T. Waterhouse.

This hammer is put into action thus: the driving strap is moved from the loose to the fast pulley which carries round the shaft, on which are cams or tappets, and these coming in contact with the cross-head or lifter on the piston rod raise the working piston to the height in the cylinder necessary to compress the air to the density or power required. On the cams or tappets passing the cross-head, the hammer falls, when, according to the density of the atmosphere used, so is the power of the fall of the hammer multiplied; as for instance, a hammer of 5 cwt. is readily made to give a blow greater than that of an unassisted hammer of a ton. The number of blows may vary from 100 to 500 per minute, according to the diameter of the cylinder and to the length of the stroke; the operator always having, by aid of the valves, absolute control over the force of each blow, so that at a fall of three or four inches all the exerting power of the compressed air may be given, whilst at ten or twelve inches the blow of the hammer may be reduced below its natural momentum, or arrested altogether, before it reaches the matter being operated upon. For all purposes of light forging this hammer is specially applicable.

*60. Patent Improved Steam Hammer; Bowling Iron Company.

The main feature of this invention consists in disposing the steam cylinder at the back of the hammer block, where it is firmly bolted between the vertical cheeks of the standards; thus forming a most substantial connection and support to the main framing, and effecting a very important reduction in the absolute height of the machine, by which means the lateral stiffness is so much increased as to render the use of props and stays altogether unnecessary. In this way the hammer block can be made of any available length, thereby securing ample length of guiding surface without increasing the height of the framing. Strong adjustable guide plates are provided to compensate any wearing away of the slides, which would otherwise tend to impair the smooth and steady motion. The piston rod is attached to a strong projection on the upper part of the hammer block; which overhangs the cylinder. In this arrangement, it will be observed, the piston rod is relieved from the destructive effects of compression arising from the concussion to which, in the ordinary arrangement, the piston rod is exposed at every blow of the hammer, which soon produces extreme brittleness and liability to fracture. The piston is formed of one piece of wrought iron, made as light as safety will permit, and fitted with a very light and simple kind of metallic packing, which is found to answer well. In other steam hammers the piston rods and pistons are exceedingly troublesome, but in this they have not caused the slightest inconvenience or appearance of defect. This superiority is accounted for by the rod being much better calculated to resist extension than compression. At the lower part of the back of the cylinder is situated the valve-box, to which are attached the steam and exhausting pipes, the latter having a branch thoroughfare communicating with the upper part of the cylinder, for equalising the pressure on both sides of the piston during the descent of the hammer. The valve connections are brought round to the front of the machine where the platform is situated, and other necessary arrangements made for the convenience of the attendant in adjusting and regulating the motion of the hammer. Two double-acting valves are provided, one for the self-acting motion, the other for working the hammer by hand; the latter also answers the purpose of the ordinary stop or throttle valve. This double-acting hand valve, in combination with the self-acting motion, is an exceedingly useful addition,—in fact, it is indispensable to a perfect machine. It enables the attendant to dispense with the self-acting apparatus, and work the hammer by hand at any moment, so as to produce any desired length of stroke or intensity of blow, changing instantly from one extreme to the other with the greatest ease and precision. Both valves are perfectly balanced as regards the steam pressure, so as to require the least possible amount of force to work them; the valve gear is consequently not subjected to the rapid wear and tear of the old methods in which the common slide valve is used. Instead of the ordinary contrivances for raising and lowering the tappet lever, a rack and pinion are here employed, and are found to answer much better, being quicker in action, easier for the attendant to work, and simpler in every respect. The stuffing boxes (three of which are provided, one for the piston rod, and two for the valve spindles) are arranged so as not to be in contact with the steam; the stuffing being used merely to prevent escape from the exhausting passages, requires little or no attention; indeed it may be almost dispensed with. The valves and valve gear being situated low down in the framing, admit of very easy access for examination or adjustment, and their several parts can be readily taken asunder, without the use of ladders or scaffolding. The same remark applies to the taking out of the piston, which is easily accomplished without detaching it from the hammer block, it being simply necessary to unscrew the nuts of the cylinder cover and hoist the hammer block to a sufficient distance up the guides, which is readily done by the assistance of the forge crane, or a common screw jack. A five-ton hammer, constructed in accordance with these improvements, has been in successful operation at the Bowling Iron Company's Works nearly a year, and has, for some time past, been satisfactorily employed in forging the heavy wrought-iron plates for floating batteries.



60*a*. Elongating Piston Pile Driving Engine; James Winter, jun.

The application of the elongating piston engine entirely does away with the rotary motion usually employed. As the monkey falls on the pile, it drives it into the required spot, and as the pile descends it raises a stop catch, fixed in a sliding position on the rack, which becomes alternately fixed and loose, by which means it allows the alteration at every stroke, and enables the piston to elongate and pick up the monkey until it has driven the pile to the required distance. It can also be used as a steam crane for lifting cannon, &c., &c., for military purposes, by a simple beam or arm being thrown from the top and the chain being placed over the pulley. The piston can be used in a fixed position by securing the running catch at a given spot, or can be left self-acting at will when used as a pile driver. The advantages of using an engine of this description are many, as it can be attached to frames now in use without incurring additional expense in fitting them to receive it. The pillar, with engine fixed, can be removed from one frame and fitted to another, thereby saving expense, removing the engine alone in the event of it being required to do work at the same spot again, tide having set in. The whole machine is so constructed that it can be taken to pieces, rendering it in every respect portable.

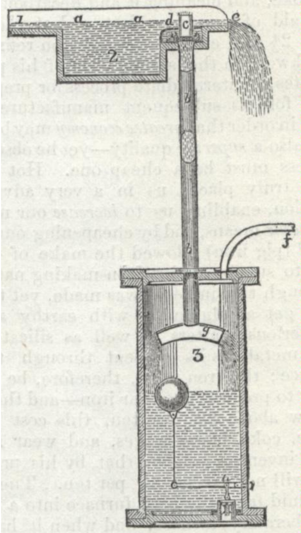
*61. Patent Lubricating Machinery; J. Mitchell. Exhibited by F. Haines and Co.

62. Apparatus for the Protection of Life in the Shafts of Coal and other Mines (provisionally protected); F. J. Emery.

The immediate object of the invention is to arrest the descent of "cages" or "corves," in the event of the rope or chain breaking by which they are being hoisted or lowered. The sides of the pit are furnished with two "guiders," or shafts of wood, whose office is, by means of clips attached to the sides of the cage (and which slide up or down the "guiders" with ease), to keep the cage even and steady in passing up or down the shaft of the mine. These "guiders," extending from some feet above the surface to the bottom of the pit, are grooved from end to end, and in the grooves are placed toothed iron racks, extending the whole length of the "guiders," formed of convenient lengths, and securely rivetted thereto. On the top of the cage (over all of which there will be a kind of parachute in ordinary working) are mounted two-toothed wheels, and on the same pinions two ratchet-wheels, the former turning easily on their axes, and working without any strain or effort in the side racks. There are also on the top of the cage two levers or pauls, from the outer extremities of which are chains or ropes attached to the ring or hook which supports the four chains or ropes from each corner of the cage. The inner extremities of these levers or pauls being acted upon by springs, immediately the support is gone from the rope breaking, the pauls are forced into the ratchet wheel, by which means the two large wheels become fixed firmly in the side racks. This apparatus will be found useful as a moveable scaffolding in effecting repairs in the shafts of mines; for, by attaching the rope or chain to a windlass in the cage itself, the workman may raise or lower himself two or three inches at a time if necessary. Whenever it may be desirable to use the cage without the wheels or rack, this may be effected by a turn of the winch in the middle of the cage, which will entirely free the wheels from the rack by withdrawing the former towards the centre of the cage; and, on the other hand, the same means may be had recourse to to make the machine more secure by projecting the cogs of the wheel further into the racks. With regard to the cost, where "guiders" are being fitted up in the shafts, and that plan is becoming, it is believed, very general, the cost of the apparatus would be a trifling addition to the general outlay; because it is only necessary to groove the "guider," insert the "racks," and mount the arrangement of wheels," &c., on the top of the cage.

63. Patent Hydro-Pneumatic Ventilating or Blowing Apparatus; J. Coulson.

This apparatus is designed and adapted for the ventilation of adits, levels, and other recesses of mines having close ends, where the temperature is high, or the air through any cause unfit for respiration. 1, launder, conveying water; 2, reservoir, which should be fixed on the surface, near the principal shaft of the mine; 3, hydro-pneumatic box, placed on one side of the adit level, immediately under the reservoir; 4, self-acting valve, regulating height of water in No 3; *a a*, water level; *b b*, tube, conveying water and air; *c*, glass tube, open at both ends, and suspended over tube *b*; *d d*, bridge, supporting glass tube; *e*, launder for surplus water *f f*, air tube, leading into the mine; *g g*, cross tube, to break the fall of water. From the above it will be seen that the effect produced by the adjustment of the glass tube is one of the new principles in this invention. By the adjustment of the glass tube (nicely regulated by a slide), which consists in suspending it over the orifice of the large tube, *b b*, exactly at that point where no more water can be admitted into tube, *b b*, than is necessary to draw in the largest possible quantity of air, a vortex is produced, and a continuous stream of air and water, varying in proportions, according to the distance between the reservoirs and the hydro-pneumatic box, is conveyed from the former into the latter. Here the air and water are separated—the water escaping through the self-acting valve, 4, whilst the air is forced through the tube, *f f*, and conveyed to any distance.



64. Patent Apparatus for Washing and Separating Metallic Ores and other Matters; D. Zenner.

The invention consists of a table, rotating on its axis, the surface of which inclines upwards from its circumference. The ores, &c., held in mechanical suspension in water, are allowed to fall on the table through a circular gutter in a continuous stream, from whence the lightest particles are carried by the force of the current over the edge and into the receptacle below. The ores remaining on the table in its onward course, are subjected to the action of currents of water distributed by the larger division of the circular gutter (and which may be aided by the supplementary spout), and are also kept in agitation by brushes to expose the ores more effectually to the current of water. The purified ores remaining on the table are removed by an eccentric brush into a receptacle below. The advantages of this apparatus are—first, a continuous action; second, a perfect separation of the matters treated into two or more different classes, according to their specific gravity or size of grain; and third, requiring no hand-labour or attention of any kind, beyond the removal of the separated matters from the pits.

65. Specimen of Copper Ore, from New Brunswick, British N. America; G. Babb.

66. Samples of Refined Iron; Charles Sanderson.

No. 1 is a sample of good No. 3 forge pig iron; No. 2 is a sample of mottled pig iron; No. 3 is a sample of white iron cast in an iron mould; (all these are just as they run from the blast furnace). No. 4 is a sample of the inventor's refined metal, made from all No. 1 named above. called good forge pig No. 3; No. 5 is a sample made from a mixture of 2 and 3, that is, 15 cwt. mottled and 5 cwt. white to a charge. The utility of this process may be soon explained. When pig iron is puddled without submitting it to any cleansing or purifying process the waste is large; Mr. Blackwell, in his paper read before the Society of Arts this session, says it takes thirty cwt. of pig iron to produce one ton of merchant bars; hitherto pig iron has been refined upon the ordinary plan, by melting pig iron on coke, and cleaning it and decarbonising it by the aid of a strong blast, and at a loss of iron from 2½ to 4 cwt. per ton of iron refined. Mr. Blackwell, in the second part of his paper, advocates an intermediate process for preparing pig iron for its subsequent manufacture into bar iron, in order that *greater economy* may be secured, and also a *superior* quality—yet he observes, this process must be a cheap one. Hot blast, he says, truly placed us in a very advantageous position, enabling us to *increase* our make with the *same* means, and by cheapening our raw material (pig iron) allowed the make of malleable iron to supplant other iron-making nations; but although this increase was made, yet the metal does get amalgamated with earthy and other deleterious matters, as well as silicate, &c., of the metal in its descent through the blast furnace; the iron must, therefore, be refined in order to produce good bar iron—and the expense is now about 20s. per ton, this cost being for waste, coke, blast, wages, and wear and tear. The inventor believes that by his process the cost will not exceed 3s. per ton. The metal is run fluid from the blast furnace into a large size reverberatory furnace, and when it has settled the surface is skimmed, to free it from scum or scoriæ; then a flux is added, and in an hour the whole of the metal is refined, and it is found of a quality superior to the iron now refined by the ordinary process. No blast is needed, and the iron is never in *contact* with the fuel. Some malleable iron has been made, and superior bars have been produced at a waste of only 24 cwt. of pig iron per ton of bars instead of 30 cwt.; but it is supposed that when the refined metal is puddled a little differently—better iron than that now made in Wales may be produced at 22 cwt. per ton of pig iron per ton of bars. If this can be done even at 23 cwt., there will be a saving of 7 cwt. of metal, the value of which may fairly be stated at 3s. 6d. per cwt., or 24s. 6d. per ton of bar iron produced.

66*a*. Patent Improvements in Saws; B. Moore. Exhibited by W. H. Walenn.

This invention consists in forming improved cutting edges upon the opposite sides of saw teeth, by means of a grooved recess or space between the said sides, and also in bevelling or rounding the back of the teeth in a form corresponding to the said recess. This recess is formed upon the front edge of the tooth, thereby making both sides of the front of the tooth a cutting edge, and enabling the tooth, from the moment of its entry into the wood, to act truly as a cutter, and not, as at present, merely a tearer of the wood. The advantage gained by the use of this saw is, that the resulting surface produced by its action is not a rugged surface, but one in every respect similar to that produced by planing.

67. Patent Stationary Self-acting Tube Cutter; Kendall and Gent.

This machine is for the purpose of cutting metallic tubes or solid bars of all kinds, and is especially adapted for those of locomotive, marine, and other boilers; gas engineers and fitters, metallic bed and ferrule makers, &c. A strong brass locomotive tube is cut through by it in twelve seconds, including the fixing; the necessity of files and saws and the sharpening of the same being dispensed with. The tube is cut by means of a tool that is fixed in a slide which revolves round the tube or bar to be cut. Upon the screw of the slide is fixed a ratchet-wheel that comes in contact with a pin each revolution, slightly turning the screw that moves the slide, and forcing the tool into the article to be cut uniformly until it is severed. The tube is fixed by means of a self-adjusting vice, the jaws of which are moved at pleasure in opposite directions in a slide, by turning a hand-wheel that moves a right-handed screw in one jaw and a left-handed screw in the other, and by this means all sizes of tubes are held firm to a given centre, round which the slide and screw revolve.

68. Patent Adjustable Vice; —Henry. Exhibited by H. Sykes.

This vice can be raised or lowered at pleasure, by means of two nuts at the bottom of the spindle of the fixed jaw. It may be set to any angle with the bench. It is kept in its position by tightening nuts on either side of the bench plate. The upper and lower parts of the vice, being connected by deep and well-fitted sockets, are allowed to adjust themselves to the taper required, by drawing cotters, which keep them in the ordinary position. The screw and box being fitted with spherical washers, the vice has at all times a perfect motion. The vice may be fitted with a slide worked by side links, so that it can at any time be made parallel, and be kept in the required position.

69. Patent Vice, for Griping Tapered Objects, &c.; Marchinton Brothers.

In this vice, the stationary jaw is firmly held by two brackets. The front jaw is attached to a hinge joint, which is again attached to a square slide, that moves through a corresponding socket, which is moved backwards or forwards by a crank motion, so as to bring the front jaw, when at its extension, parallel with the back or fixed jaw; consequently, it grips it equally the whole depth of the jaws. The joint moves upon a vertical spindle, upon which is fixed a spiral spring, so that it allows the jaw to adjust itself to any tapered or square object, without interfering with the action of the spring. There is a thumb or set screw attached to the hinge joint, which is unscrewed before griping a tapered object, and screwed up again before griping a square. The upper bracket is attached to the column of the back jaw in the ordinary way, by gib and cotter, with a clasp to fit an octagon part of the fixed jaw, which allows of its being adjusted to the bench at different angles. The spindle is screwed, and has two nuts, by which the vice can be raised or lowered at the will of the workman.

70. Improvements in holding Instruments; J. Brodie. Exhibited by R. Timmins and Sons.

These improvements include a variety of new forms of pliers, pincers, vices, rope holders, &c., and depend for their action on the more equable diffusion of pressure on the substance intended to be held. In the vice one of the jaws moves horizontally, and consequently adapts itself to clip substances of almost any shape. A similar principle is adopted in the pliers.

71. Improved Portable Slitting and Polishing Machine, for Slitting and Polishing Minerals, &c.; J. Fenn.

This contrivance is adapted to the use of microscopists (for cutting sections), geologists, surgeons, amateur turners, &c. When used as a lapidary's apparatus, the spindle carrying the slitting plate is fitted with a screw, the same as the mandril of an ordinary lathe. It can be removed, and the laps, polishing buffs, or other grinding or polishing apparatus substituted. When fitted with the circular Arkansas oil-stone, it will be found invaluable for sharpening and setting angular tools, as it can be used with the goniometer. It may be worked by the hand, or by a treddle, which, being made telescopic, can easily be adjusted to the height of any ordinary table or workbench.

72. Ratchet Brace; J. Fenn. Exhibited by Robertson, Brooman, and Co.

In this ratchet-brace, the catch-wheel is fitted inside the bow of the lever, and a slot is cut in the lever to admit a sliding catch, which is driven into contact with the wheel by means of a spring placed at the back of it. The advantages possessed by this instrument are, that as the strain on the lever is increased, the catch takes a firmer hold of the catch-wheel, and the brace is, therefore, well adapted for heavy work; and that, from the simplicity of its construction, there is but little liability of its getting out of order. (See *Mechanics' Magazine*, April 14, 1855).

73. Rotary Oil Stone; J. Fenn.

74. Arkansas Oil Stone, imported from the United States; J. Fenn.

75. Self-Centering Universal Face Chuck for Lathes; F. Haines.

In this chuck three chops or dogs are operated upon by one movement, by means of a key. The chops may be of any form, to hold work either inside or outside.

76. Patent Flexible Rotatory Motion; H. A. Dewar.

The object of this invention is to convey rotatory motion through a flexible instead of an inflexible shaft. The flexibility is obtained by connecting together a series of short lengths of shafting (each rigid in itself) by means of universal joints of various kinds, such as "Hooper's Joint," which is the one used in the model exhibited. The whole length of the shaft so connected is encased in a series of tubes, also connected together by balls and sockets, these latter serving the double purpose of allowing great freedom of motion and effectually guarding the universal joints from injury, dust, &c. The shafts are made of greater diameter near the joints than elsewhere, and fit the calibre of the protecting tubes with accuracy, so that the tubes form journals for the shaft to work in at their junction with the balls and sockets. This invention may be rendered available wherever it is of importance to convey rotatory motion to the object to be acted on, as in the boring of holes in shipbuilding, especially when the diagonal plank principle is adopted, also in the abrading and polishing of large masses of granite or marble, where an irregular surface is required, whether in intaglio, alto, or basso-relievo. The inventor applies it for cutting out decayed portions of teeth, previous to stopping them, and in preparing the roots of front teeth for receiving artificial teeth on pivots, as well as in many other operations connected with dental surgery. In fact, in all mechanical operations where rotatory motion is applied for drilling, &c., this principle may be used.

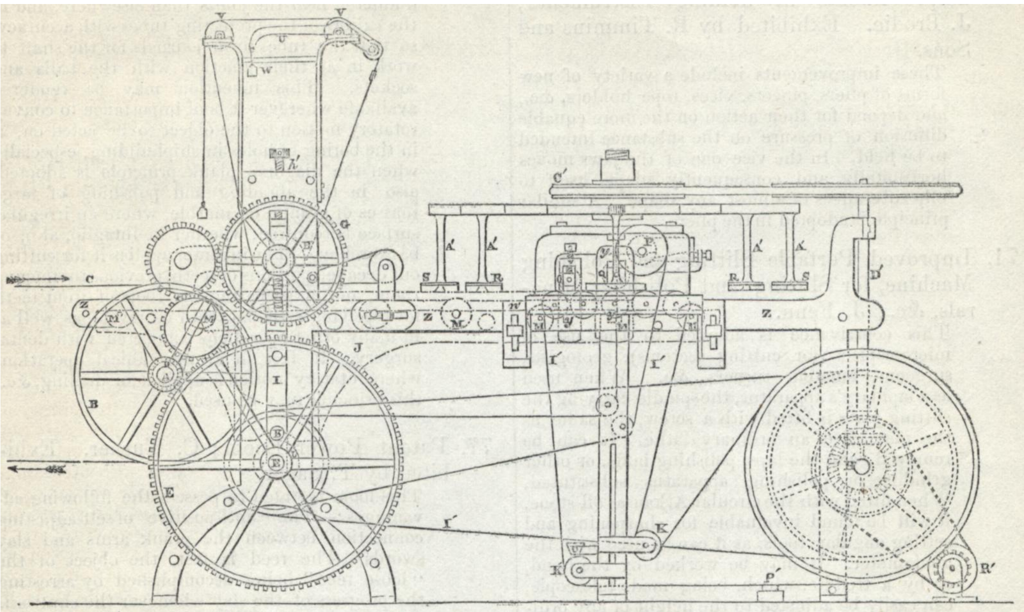
77. Patent Power Loom; C. Turner. Exhibited by T. Sagar.

This loom is stated to possess the following advantages:—The "anti-positive" of self-adjusting connection between the crank arms and slay swords. The reed is fast, the object of the "loose reed" being accomplished by arresting the progress of the slay whenever the shuttle is impeded or caught in the shed, thereby making any breakage of the warp impossible, but still allowing the crank to pass once round. The trouble of replacing the reed by hand, as in the loose reed loom, is dispensed with. The quality or strength of the cloth is of no consequence, as it weaves the strongest goods that are made with the same facility as the lightest, whilst that which can be made by the "loose reed" loom is limited. The power required to drive the loom is said to be reduced *twenty per cent.*, the principle of the machine allowing the crank, crank-arms, slay, slay-swords, stop rod, &c., and all things in connection therewith, to be made lighter (in some cases not half the weight) than the similar parts in other looms. This loom being capable of being driven at a higher speed than others, there is a corresponding increase of production. The "concussion" arising from the sudden stoppage of the loom whenever the shuttle misses boxing *is prevented.* The patent principle is capable of application to *old looms.*

78. Machinery for Spinning and Buttoning Horse-hair; Charles Nightingale.

This invention is intended to substitute mechanism for hand labour, by combining the two processes of spinning and "buttoning" (which together constitute that of curling) in such a manner as to admit of the "buttoning" being carried on without stopping the spinning, instead of the usual practice of spinning and "buttoning" alternately. The means by which this effect is produced consists of a spindle mounted within a wheel or pulley to which rotary motion is imparted, the material to be spun being wound round the spindle, and the end carried to a revolving reel or other suitable contrivance, so that as the material is supplied to the spindle at one side of the revolving wheel or pulley it becomes spun, and is delivered from the spindle in a spun state, and as it is so delivered, becomes further twisted or "buttoned" by means of the separate revolution imparted to the reel or other contrivance on which it is wound or to which it is attached.

*79. Plate Printing Machine, for engraved plates; R. Neale.



The plate is attached to a bed having a reciprocating motion. The difficulty of printing from engraved plates by machinery has been owing to the inability of substituting for the hand a mode of cleaning and polishing the plate mechanically. In this machine this is effected by a series of wipers and polishers, having a rotary motion, and accurately adjusted, being passed over the surface of the plate in succession, so as first to remove the surplus ink, and then to clean and polish the surface of the plate, ready to receive the paper to be printed. These wipers and polishers are cleaned in their turn by coming in contact with the surfaces of cleaning belts, and are made ready to act again on the plate.

BUILDING CONTRIVANCES AND MATERIALS, AND HARDWARE.

80. Patent Siliceous Stone; F. Ransome.

These specimens show improvements in the manufacture, resulting from a new patented drying process. This stone is composed of particles of sandstone grit, intimately combined with the silicate of soda, which is produced by dissolving flint by heat with caustic soda, in steam boilers. When subjected to great heat in the kilns, this combination produces a material which is indestructible by atmospheric influence, and capable of being produced in every form of architectural embellishment, and enriched to any degree, without much additional outlay in the manufacture.

81. Improved Ventilating Hollow Bricks; B. Looker, jun.

These bricks are of common dimensions, having two openings, each about two inches square; the openings being so arranged that the bricks may be used, with the necessary bond, in 4½ inch brickwork, or in 9-inch piers, and at the same time preserve continuous air-passages through them. In an ordinary cottage fire-place, constructed with the ventilating bricks, the outer air is admitted at the back of the fire-place into an air chamber beneath the hearth-plate; thence it is conducted up the brick jambs into a box mantel, of wood, stone, or other suitable material, from which it passes up the chimney breast, and is delivered warm through the cut bricks under the ceiling. The air acquires its warmth chiefly from the smoke flue, whereby there is an economy of heat and of fuel. This arrangement, besides affording ventilation, gives uniformity of temperature to all parts of a room. Another adaptation is where the pure air enters through an opening under the hearth, and is delivered on all four sides of the smoke flue. This arrangement is designed for the centre of an apartment, and is adapted for warming and ventilating barracks, lodging-houses, hospitals, &c. The figures on the models are intended to show the continuity of the different air passages. The drab lines indicate the position of the box mantel, and the dark lines the hearth plate. These bricks may be also arranged to form air flues at the back of a fire-place, to be turned to the right or left, by which means part of the heat in the smoke flue may be carried to any other room not provided with a fire-place.

82. Patent Tubular Ventilators; B. Looker, jun.

These ventilators admit pure air through an external wall without draught, the amount of air being regulated by a sliding perforated tube. They are made in all kinds of pottery, adapted to every description of building or apartment.

83. Patent Chimney Tops; B. Looker, jun.

These chimney tops are designed to prevent down-draught. They have small openings around the base, slanting in an upward direction, while the smoke issues through larger ones in the upper part. The latter openings are protected by flanges from downward currents.

84. Patent Glazed and Coloured-Faced Hollow Bricks; — Bale. Exhibited by the Patent Architectural Pottery Co.

85. Patent Hoop Iron Bond for Building Purposes; F. Tyerman.

The object of this patent is to give to ordinary hoop iron an additional key, so that its tying or holding qualities may be increased. This is effected by notching the iron at intervals of 11¾ inches on both sides alternately, and turning one side of each notch in succession in contrary directions on the reverse sides of the iron; thus forming reversed claws, which are so bent that a direct end grain of the iron is presented longitudinally, offering a powerful and effectual resistance, and which become, when built into the brick work, imbedded in the structure, and so prevent the possibility of the iron being drawn out, by which means a perfect and complete tie is obtained, necessity of lapping avoided, longitudinal escape prevented, and the whole building firmly and securely bonded together. (See *Practical Mechanics' Journal*, vol. viii., *Civil Engineer and Architects' Journal*, vol. xviii., *Artizan*, vol. xiii., *Land and Building News*, vol. i., *Builder*, vol. xiii.)

86. Improvements in Roofing, Glazing, Flooring, and Paving; W. Bridges Adams.

1. Sample of elastic india-rubber caulking in dovetail joints of sawn slate, to form water-tight flat roofs. The structure is simple. Deals, on edge, span from wall to wall, and sawn slates, 6ft. by 3ft., are laid on them, their position being maintained by a fillet of galvanised hoop iron inserted in the timber between the joints. Strips of wood or lead are inserted, to keep the elastic caulking firm in the dovetails. The slates project over the walls, and galvanised iron gutters, forming a cornice, are bolted to them. Thus a tight slate pavement is formed, serving as a terrace, or to receive a greenhouse. Iron may be used instead of timber to support the slates. The weight will be about 15lbs. per foot; no lead gutters or carpenters' work are required; and every part where a leak can occur is accessible to constant view. By a peculiar arrangement, roofs of this flat class, and substituting glass for slate, in various colours for ornamental effect, may be extended to spaces of two to three hundred feet without intermediate supports. 2. Sample of plate-glass in grooves, with cork-stopping above the glass, as an elastic substitute for brittle putty. This is adapted for skylights and greenhouses, as not subject to leak. 3. A similar arrangement, with the cork at the edges of common sheet glass. 4. A sample of glazing, with the glass between slips of india-rubber, screwed together with fillets. 5. Mode of framing a sheet of thick glass for a flat skylight, watertight, to fit on the roof frame, like a ship's hatch.

6. Samples of perforated iron paving, in triangular forms, getting rid of dirt, dust, and rain; adapted for greenhouses, garden walks, or foot pavement of streets, or to improvise a temporary walk across a field, being adapted for either even or uneven surfaces, to any width of length required, without previous preparation or skilled labour. 7. Sample of similar paving edge drained and fitted with tesselated tiles. 8. Samples of moveable parquette oak flooring, in triangular iron frames, edge drained, adapted for greenhouses or for railway station rooms.

86a. Improvements in Fire-proof Flooring and Roofing, &c.; Isaac Farrell.

This system dispenses with the use of brick arches and metal beams, or joists or rafters of any description in moderate spans. It consists of two courses of tiles imbedded in an intermediate layer of cement. These tiles are each, say, 12 inches square and 2 inches thick. They are made with indents in the back, about half an inch in depth, which lighten the tile and enable it to catch firmer hold of the cement in which it is bedded. The chief peculiarity of this tile is the button, which is a projection formed on the back of the tile, and exactly in its centre; this button is about four inches in diameter, and projects about 2¼ inches, or a little more than the thickness of the tile; the stem or shank of the button is about 2½ inches diameter, and the top or flange about 1 inch thick. The four corners of the tile are cut off, and rabbeted to correspond with the form of the button, so that the part cut off each corner would be a little larger than one quarter of the button. The object of this is, that when two of these tiles are placed back to back, one corner of each fits into the button of the other, leaving a little freedom for setting, and thus locks them together. The intermediate layer of cement in which they are embedded filling the corresponding indents in both tiles, unites them thoroughly, and prevents the possibility of lateral separation.

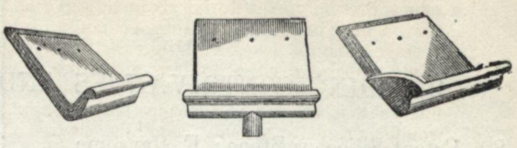
87. Patent Glass Roofing Tile; J. Bowron and Co.

These tiles are manufactured in moulds, under powerful pressure, by which a uniform shape and sharpness of outline are obtained. The ledge or nozzle can be made of any substance desired, and with mathematical precision as to the angle it forms with the tile.

88. Patent Tubular or Hollow Roofing Tile; J. S. Norton.

These tiles being non-conductors, the sun has little or no power on a roof of this description beyond the outer surface, the heat being cut off by the presence of air in the tubes running all through the tile. The plans frequently adopted for keeping down the temperature of the uppermost rooms are, therefore, now no longer necessary. By using these tiles with the tubes left open, they form efficient ventilators, the air running upwards in the same direction as the roof. They are not so liable to leakage, as, should the outer plate get fractured, the rain would be carried of by the chamber below.

89. Patent Roof Gutter for Spouting Slated, Tiled, or Thatched Houses or other Structures; W. Beadon. Exhibited by J. B. Lawes, F.R.S.



PLAIN GUTTER TILE.

DITTO WITH OUTLET.

DITTO WITH LEFT STOP END.

This invention is intended to supersede the ordinary kind of spouting. The tile is made of burnt clay, and is fixed to the rafters, or to a thin batten nailed to them. Each tile is cemented to its neighbour at a right-angled joint. When fixed, it is as firm as the wall upon which it is placed; and, from its well known nature, it will last as long as the building itself, without repair or paint. The price per lineal foot being less than ordinary spouting, there is a double economy in it, as it saves many square feet in roofing (whether tile, slate, or thatch). Other spouting—zinc, iron, or wood—easily corrodes or decays, and is so fragile that a ladder laid against it breaks or displaces it—and it requires frequent painting. This method will bear any weight, and is imperishable, and an ordinary workman can fix it.

*90. Patent Buckle'd Plates in several of their Applications to Fireproof and other Flooring, &c.; R. Mallet.

The title "buckle'd-plate" has been given to any plate of iron or other metal, whether square, rectangular, or polygonal, the surface of which has been curved or arched, with a very small rise or curvature springing from the edges of the plate in all directions towards the centre, with or without a flat margin all round, such that a transverse section of the plate, in any direction, presents a curved line. Each plate is, therefore, a sort of very flat polygonal dome or groined arch; the thrusts of each side of which are sustained by the tensions of the outer portions of the adjacent sides of the plate. (See *Engineer*, No. 1.)

91. Permanent Ventilator; R. D. Chantrell.

The upper rail of the window, or sash, is to be cut out one inch in depth for nearly its whole length, the cut being in a slanting direction. Two or more blocks of half an inch in depth, by the thickness of the frame, are then to be placed at intervals in this opening. In these, and at the ends, two narrow parallel grooves, half an inch asunder, are to be cut. In these grooves are to be inserted two slips of wire gauze, half an inch broad and 30 meshes to the inch. Upon the blocks, and over the wire, the slip of wood, reduced half an inch, is to be fixed, so as to be level with the top of the sash; and a permanent ventilator is thus formed, applicable to every mansion, cottage, or other building.

91a. Prevention of Smoke from House Chimneys, and the Ventilation of Rooms; G. Wyld, M.D.

At Messrs. Cubitt's factory, Gray's-inn-road, Mr. Manley's process of precipitating smoke by descending water is in operation at one of their furnaces, and Dr. Wyld's suggestion consists in applying this method to the destruction of smoke from the chimneys of private houses. With regard to the ventilation of apartments, as those ventilators which open into the chimney of the room to be ventilated, operate only during the presence of a fire in the grate, and as, in sitting-rooms, fires only exist during six months in each year, while in bed-rooms they do not on an average exist for one month in each year, Dr. Wyld proposes leading an iron pipe from the back of the kitchen fire to the top of the chimney flue, so that the air in this pipe being heated would continually ascend. From the centre of the ceiling of each apartment in a house a feeding-pipe, opening by an ornamental rose, would pass into the main pipe, and as the kitchen fire is in operation throughout the year, and is hot for twenty hours out of the twenty-four, there would be maintained an almost continual ventilation day and night in every apartment.

92. Ornamental Sash Bars and Internal Decorations for Houses and other Buildings, Cabins of Vessels, &c.; Henry Bach.

This invention consists in the use of glass pillars and facings gilded or painted at the back, and applied to the different parts of houses and other buildings for ornamental purposes. The form of these glass pillars and facings may be adapted to suit the various articles or parts of buildings, &c., requiring to be ornamented, and they may be variously manufactured and combined. Also the painting and gilding at the back of the facings may be varied so as to harmonise with any style of decoration that may happen to be adopted in the apartment or building. The invention itself is not limited to any particular mode of manufacture or style of decoration. The articles in the case exhibited are adapted for sash bars.

93. Patent Sewer and Drain Pipes, and Connections; T. G. Cooper.

These pipes are made in two parts, longitudinally, with projections and indents on their edges, which interlock with each other, and, by means of a small quantity of interposed cement, form a complete pipe, with a flush water-way throughout. When laying down these pipes, the upper and lower parts are so arranged, lengthways, as to break joint; half-lengths being introduced at the ends to complete the pipe. These pipes are made in all sizes, from one foot diameter and upwards. Junctions, either tees, crosses, or bends, can be moulded in one of the halves, or inserted in openings left in the upper half for that purpose. The connections for earthenware drain or sewer pipes, although applicable to pipes of all sizes, are more particularly designed for pipes of twelve inches diameter and under. These connections are formed by short lengths of pipe of suitable dimensions, in two parts, having alternate projections and depressions on their edges, which, being brought together around the ends of two plain cylindrical pipes, with a suitable cement, firmly joins them together.

94. Patent Improved Drain Tiles; G. Jennings.

95. Patent Connections for Earthenware Soil and Rain-Water Pipes; G. Jennings.

*96. Patent Kiln for Drying Wheat and other Grain; F. Journeaux.

This kiln consists of a chimney or hot-air flue, containing wire cases, in which the grain is dried while passing from top to bottom. There is an appliance fixed at the bottom of the wire cases to cause the grain to flow evenly in their whole width, with a slide for regulating the feed. In this kiln, the wheat being all in motion during the process of drying, the possibility of scorching is prevented, which on the old system of drying can scarcely be avoided. The wheat is also much brighter when dried, giving more colour and strength to the flour, the steam from the wheat passing away at once, in place of being forced through it over and over again, which is the case in the old kiln, in which the bottom of a cast, when dried, being turned to the surface, and what was on the surface turned under, the steam must force through the top, which not only injures the colour but also the strength and sweetness of the wheat. The grain is evenly and thoroughly dried, without the bran being rendered crisp and short, which enables the mill to grind more, and prevents speck. The bran being perfectly clean, will consequently give more produce.

97. Patent Hydrometic and Economic Oven; J. Dupre.

It is said that the bread baked in this oven is free from the sulphur which it would have in the old ovens, and that about fifty per cent. less coals are used. The saving of time is also considerable in getting the oven hot.

98. Apparatus for Signalling and Extinguishing Fires; J. Smith.

This apparatus consists of a line carried several times along the ceiling of the chamber to be protected. This line is formed of materials that will break at certain temperatures, and liberate a weight, which strikes a catch, and sets a suitable alarum in action. A gutta percha cord is used for warehouses, &c.; for dwellings, manufactories, &c., a cord adapted to a higher temperature. The arrangements for extinguishing consist of valves or stop-cocks in various parts of the premises, kept closed by a similar cord to that used for the alarum, which breaks by the action of fire, and allows water to be thrown by a rose distributor over a certain area. The pipes connected with the valves are not ordinarily charged; a stop-cock which charges them is turned by the weight that starts the alarum.

99. Patent Fire Alarum; J. Woodley and H. H. Swinford.

This indicator apparatus comprises a case or box of sufficient capacity to contain a bell or alarum, having near it a vertical tube, closed by a valve at the bottom end, and furnished at the top end with a disc or a hollow ball of vulcanized india-rubber. On each side of the vertical tube there may be any required number of shorter tubes opening into it, according to the number of apartments or other places to be supplied, each communicating with a separate gutta percha safety tube. Within or upon each of the short horizontal tubes there must be a valve opening outwards from the main or vertical tube; and the junction of each horizontal metal tube with its gutta percha tube is made with a short intervening tube or bulb of vulcanized india-rubber. Alongside the vertical tube, and connected therewith, is a small pneumatic force-pump, and also a lever connected by a rod with a spring and a hammer to strike the alarum.

100. Patent Lock for Sliding Doors; E. Field. Exhibited by A. Tolhausen.

This invention consists in the combination of a catch and sliding bolt, both acted upon by one key, in one and the same revolution.

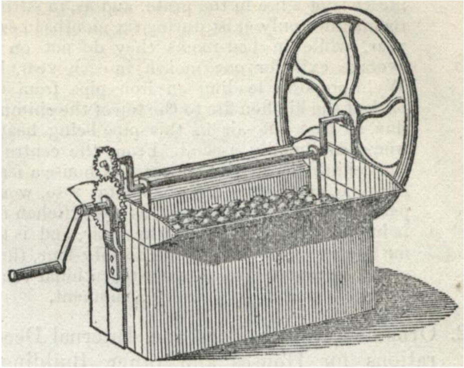
101. Patent Changeable Key and Self-Adjusting Lock; R. Larkin.

The lock, which is constructed on the principle of the usual barrel lock, is also so arranged that the circular catch-plate (within which the barrel turns, and which contains the notches through which the slides work) instead of resisting any pressure given to the sides for the purpose of causing them to bind against it, may yield freely to any such pressure, and by such movement so act upon one end of a small lever as to push the other end of it into a catch cut in the barrel itself. By this action the barrel becomes fixed, and whatever further pressure is applied, the slides remain perfectly free and unaffected by it. The object of this movement is to prevent any clue being obtained to the position of the gatings or notches in the said slides, and thus preclude the possibility of picking the lock. Wards or walls are also introduced, passing through and across the slides, for the purpose of preventing the introduction of gunpowder, or any other substance, into the interior of the lock. In order to prevent the lock being forced by sheer violence, the lower end of the revolving barrel, by which the bolt is thrown, is made of a separate piece, attached to the barrel by small screws, of strength sufficient for throwing the bolt, but not sufficient to resist any violent undue force, by which arrangement any application of such violence for the purpose of wrenching round the barrel, would simply serve to detach it from such piece, but would leave the bolt itself unmoved and inaccessible. The key is portable, convenient, and protected from injury.

102. Patent Chimney Sweeper; J. Washington.

This machine expands and contracts in a similar manner to an umbrella; it will close up so as to pass through a chimney-pot, and expand so as effectually to fill any part of the chimney.

103. Patent Washing Machine; B. Moore. Exhibited by W. H. Walenn.



This machine consists of a wooden box, or cistern, in which the frame carrying the clothes is moved up and down, either by means of a counter-balanced lever, or a winch, connected to the crank and fly-wheel shaft, from which the frame hangs, by spur gear. The requisite friction is given to the clothes in the water by means of a number of floating balls, and this action is kept within bounds, as it can never exceed the resistance offered by them. In this machine the wear and tear to the clothes, &c., washed, is less than in washing by hand, and 500 pieces of the most delicate fabrics can be completely washed in a day of 10 hours. A child 15 years of age can, with ease, work the machine for a whole day, and that without wetting her hands, thus doing the work of five or six persons. The large machine can wash 6,000 pieces per day, and is fit for laundries and large establishments. (See Patent, No. 935, April 24th, 1854.)

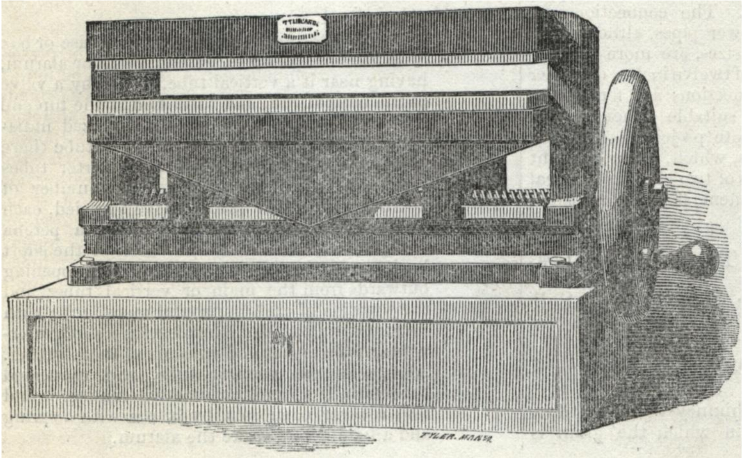
104. Patent Washing Machine; G. Kent.

105. Patent Mangle; Barber and Co.

This mangle being constructed on what is known as the angular principle, the rotatory motion is very simple. Pressure is given by means of strong springs and a screw. The motion of the mangle when at work is continuous in one direction, instead of being reciprocal.

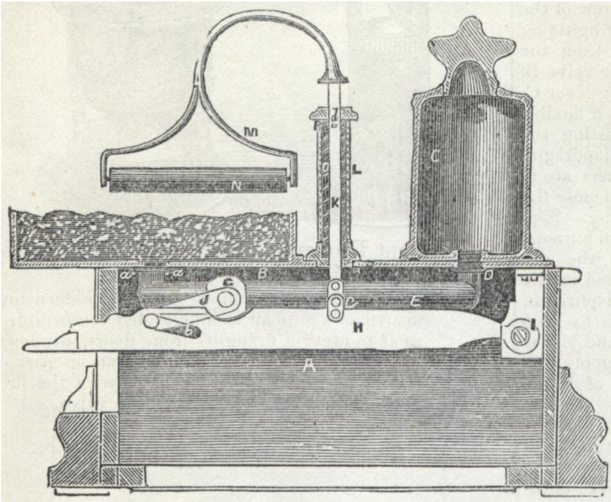
106. Improved Letter Box; A. Sweet.

107. Patent Copying Press; T. T. Lingard.



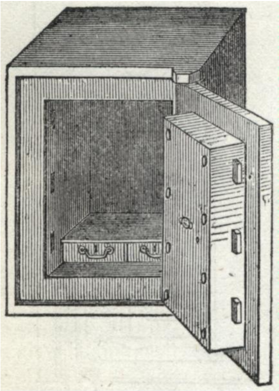
This press shows a means of obtaining great power, either for producing pressure or lifting weights, and the applications of the principle are numerous, as in shipbuilding, &c., where great weights require to be lifted through short distances. The principal advantages of this copying press over the common screw press are—greater strength and durability, in consequence of the framing being all in one piece, and the pressure being given from four points instead of one. The exertion required to produce a perfect copy is less, on account of the greater mechanical power, and this is placed in such a position as to be more conveniently worked. It does not require to be fastened down to the table, &c., upon which it stands, as there is no liability to move the press when working it, as is the case with the common press. It will produce a perfect copy in less time, and will also take more impressions. There is no space lost on the table, &c., upon which it stands, as the top of the press is available for putting anything upon, and the drawer containing the letter book and copying materials renders the press complete in itself.

108. Patent Label Damper; — Phelps. Exhibited by Robertson, Brooman, and Co.



The wood-cut represents a section of the apparatus, adapted for damping labels for railway stations, &c. A A is a box, on the top of which is screwed the metal cover, B. C is a reservoir for containing water. This reservoir is secured to the plate, B, at D, where it is also in communication with the pipe, E, which is continued along the under side of the plate, and secured at its opposite end by the screws, *a a*, where it opens into the box, F. This box, F, is cast in a piece with the metal plate, and contains a piece of sponge, which absorbs the water from the reservoir, C, and is thus kept constantly moist. G is a cock upon the pipe, for regulating the flow of the water from the reservoir to the sponge. H is a lever having its fulcrum at I, in the side of the box. The opposite end of the lever projects beyond the end of the stand, A, where it is flattened out so as to form a thumb-piece for the purpose of pressing down the lever, a slot being cut in this end of the stand to admit of this action. J is a crank upon the square end of the plug of the cock, G, the other end being provided with a stud pin, which is passed through a slot, *b b*, in the lever, H. By this means, when the lever is depressed, the crank is drawn down, the cock opened, and the water allowed to flow from the reservoir to the sponge. K is a rod connected by the link, *c*, to the lever, H, and passed up through the plate. B, and column, L, where it is bent round and formed into the fork, M, in which the spindle of the roller, N, is supported. The column, L, is hollow, and contains a helical spring, O, the lower end of which presses against the bottom of the column, and the upper end against a washer, P, secured by the pin, *d*, to the rod, K. The action of this spring is to keep the roller, N, from off the sponge when not required for use, to sustain the lever, H, in its raised position, and to keep the cock, G, closed. When using this apparatus, the label is placed upon the sponge, and the roller brought down upon it by pressing upon the end of the lever, H; the label is then drawn across the sponge, and the lower surface thereby thoroughly damped, the roller keeping all parts of the label in contact with the sponge.—(See *Mechanics' Magazine*, June 23, 1855.)

109. Patent Fire-resisting and Thief-proof Safe; George Price.



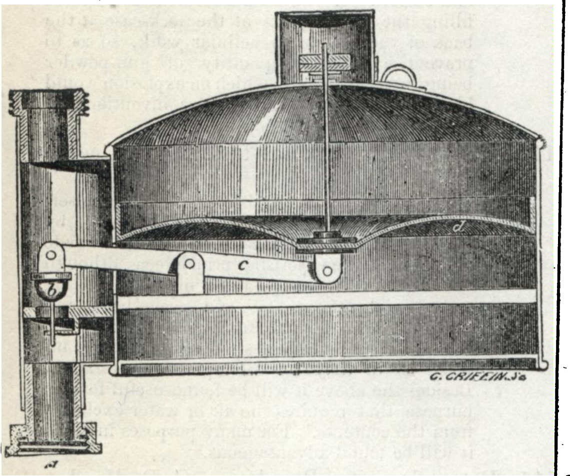
This safe, which is made fire-proof on the steam-generating principle, has the chamber protected from the oxidation caused by the alum, by coating the surfaces with paint. Another improvement is the case-hardening of the outer surface of the door, which gives it the hardness of steel, without its brittleness, and effectually prevents the safe being opened by the use of steel drills and chisels. A third improvement consists in filling the vacant parts of the lock-case at the back of the door with cellular work, so as to prevent a sufficient quantity of gun-powder being inserted therein, which on explosion would blow the safe open. This latter invention can be applied to any kind of lock.

110. Air, Water, and Steam-tight Box; George Price.

This box was originally invented for the preservation of parchment deeds from destruction by steam, when placed inside an iron-safe made fire-proof on the vaporising principle, as although the steam at a temperature of 212° (boiling water) will preserve plate and specie, books and papers uninjured, parchment and leather, on the contrary, is hopelessly destroyed, or so injured as to defy all attempts at restoration. Besides the above it will be found useful for any purpose that requires the air or water excluded from the contents. For many purposes in India it will be found advantageous.

111. Patent Dry Gas Regulator; C. R. Mead.

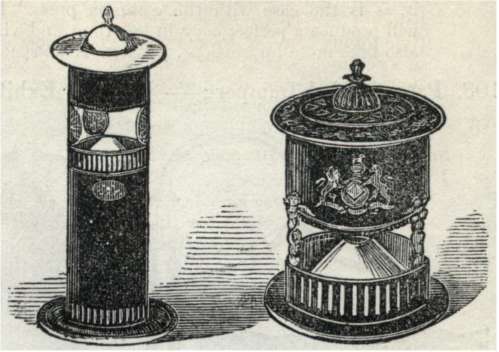
The annoyances at present generally complained of (in private houses especially) are, unsteadiness of light, excessive heat, noise or hissing at the burners, and blackened ceilings. The first is produced by variations of pressure in the street mains, and the second, third, and fourth, by excessive pressure. The object of this regulator is to obviate these evils. It consists in arresting the progress of the gas after it has passed through the meter and before it reaches the burners, and regulating or reducing the pressure to such a standard as may be necessary to supply the house or factory. The union screw at A (in the above plan) is made to fit the outlet screw of the gas meter, according to the number of lights for which it is intended. The gas passes from the meter through the aperture under the valve B. This valve is connected to a rocking lever C, which lever, in its turn, is connected to a flexible diaphragm, D. The gas, after passing the valve, acts upon the under side of the diaphragm, and, supposing that none of the burners are in use, will raise it so high as entirely to close the valve, and prevent the gas from passing. Suppose a light to be applied to one of the burners, it is clear that the valve, being closed, the only supply would be from the gas contained in the lower part of the regulators under the diaphragm, but the moment the diaphragm fails to keep up the supply, the valve B is raised, and just as much gas is allowed to pass as will supply the burner, and according to the number of lights so will the diaphragm further fall, opening the valve to supply gas to meet the new requirement. Suppose the pressure in the street mains to be five-tenths, and the regulator set to a pressure of five-tenths, if the light were burning the valve would be wide open, as shown in the engraving, but should the pressure in the mains increase, the diaphragm would instantly rise, and close the valve so as to allow only as much gas to pass as would maintain the pressure at the burners at five-tenths, and preserve it so as long as the pressure in the mains is more than the pressure at which the regulator is set. It will be seen that a wire passes through the top of the case. This wire carries the weights by which the gas consumer may determine the pressure under which his gas shall be burned, and having adjusted it he may lock down the cover, so that no alteration can be made without his knowledge.



112. Ecclesiastical Gas Fittings ; Hart and Son.

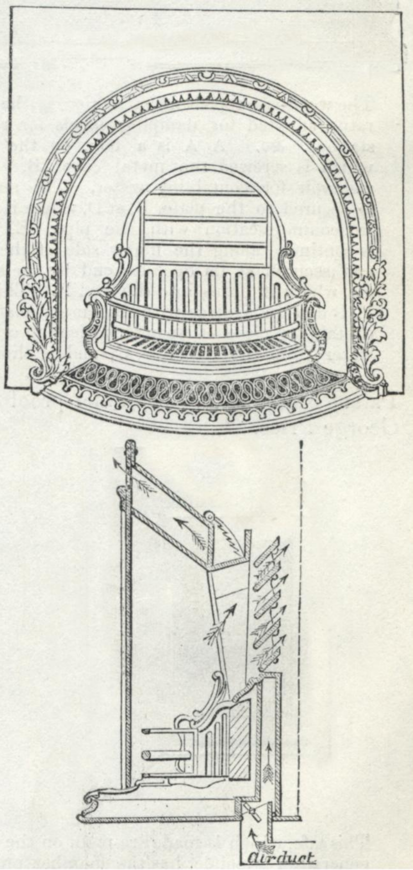
113. Gas Stoves ; E. Belmer.

The peculiarity of the stoves consists in the introduction of a metal block, which is constantly kept at a white heat, in the centre of the radiating chamber.



114. Patent Economic Ventilating and Reflector Stove ; W. Corbitt.

The object of this stove is to introduce into apartments pure air at an elevated temperature, so as to prevent draughts from doors, windows, &c. The stove is arranged so that no part of the air chambers come in contact with the fire. The supply of air is regulated by a valve.



115. Luminous Fire-place, and Self-supplying Smoke Consumer ; J. Leighton.

A stove chamber for cooking or coking the coals is at the back and sides of the fire. The fire is to be made of coke, which may be cleared out from the chamber at the back and sides every day. It is so proportioned, that the gas or bitumen from the coals passes into the fire, and, before it can escape, is consumed, at the same time giving support to and making it superior to a common coke fire. It will need little attention through the day, except an occasional stirring and putting on fresh coke.

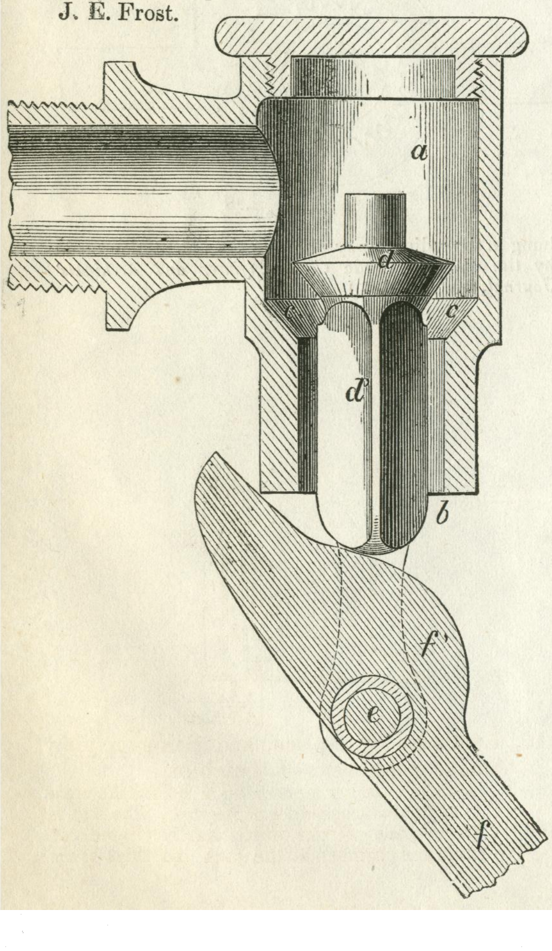
116. Patent Method of Using Smoke, Gas, &c., arising during process of Combustion of Fuel; R. A. Tucker.

This patent has for its object the use of all the smoke, gas, &c., that now passes from furnaces into the air, by so arranging a fire-place that nothing arising from the fire can pass into the flue until it has been mingled with air, and passed over a red fire. During its transit it burns like gas, economizes the fuel, and leaves no smoke to enter the chimney. In the model, the fire-place is divided; a valve at the back regulates the course of the smoke, &c., which is turned by the funnel that holds the water to supply the valve in the centre.

117. Three-Throat Bath Valve; W. Beetson.

The three valves are combined, and arranged so that one pipe only is required to be fixed to the bath for hot, cold, and waste water, saving time and expense. No external leakage or derangement of the parts can take place; and should repair at any time be requisite, it is soon accomplished by renewing the vulcanised India-rubber plac on the face of the valve, without disturbing e th or fittings.

118. Paten mprovement in Ball or Float Cocks; J. E. Frost.



This invention has for its object a peculiar construction and combination of the parts of a ball or float cock. For this purpose the barrel has within it a seat for a lift or spherical valve. Immediately below the spout or outlet of the barrel, and in a line with the centre of the valve, there is an axis for the lever which carries the ball or float. On this lever is formed a curved incline, which, when the float descends, acts on the spindle of the lift valve when used (or on the valve itself when a spherical valve is used), and thus lifts the valve off its seat against the flow and pressure of the water, which it is enabled more readily to do by reason of the position of the axis of the lever and of the incline thereon. (See the *Engineer*, vol. i., No. 6.)

119. Valve, with Waste-pipe and Valve only; G. Jennings.

This arrangement saves the ball lever, wire, &c. in cisterns, and one pipe acts both as the waste and the service.

120. Patent Sluice Valve, for Gas, Water, and Steam; G. Jennings.

121. Patent Ball Valve; G. Jennings.

122. Self-Closing Closet Cocks; G. Jennings.

123. Patent Fire-Cock, or Hydrant, with Gun-Metal Stand Pipe; G. Jennings.

124. Improved Wine or Beer-Tap; G. Jennings.

By this tap, air is admitted to the upper part of a cask, when the liquor is drawn.

125. Lavatories for Offices, Dressing Rooms, &c.; G. Jennings.

126. Patent Double-Seated Valve Closet; G. Jennings.

127. Imperishable Water-Closet; G. Jennings.

128. Patent Traps for Stables, Areas, Yards, Sinks, &c.; G. Jennings.

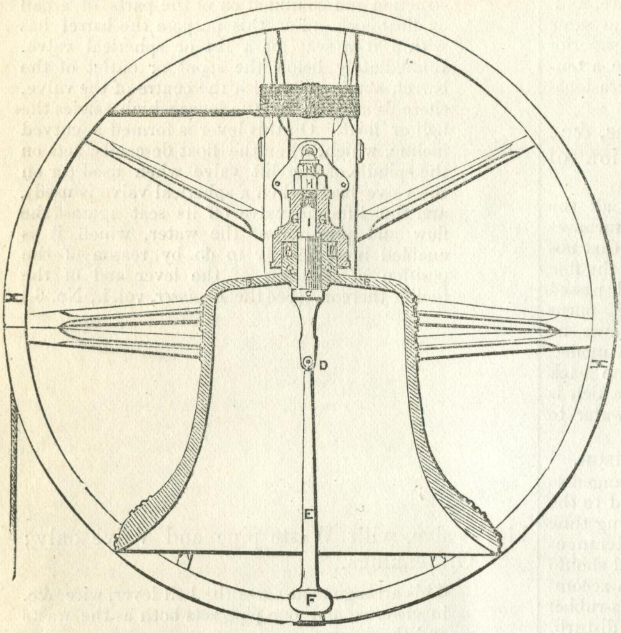
129. Patent Shop-shutter Shoe and Fastener G. Jennings.

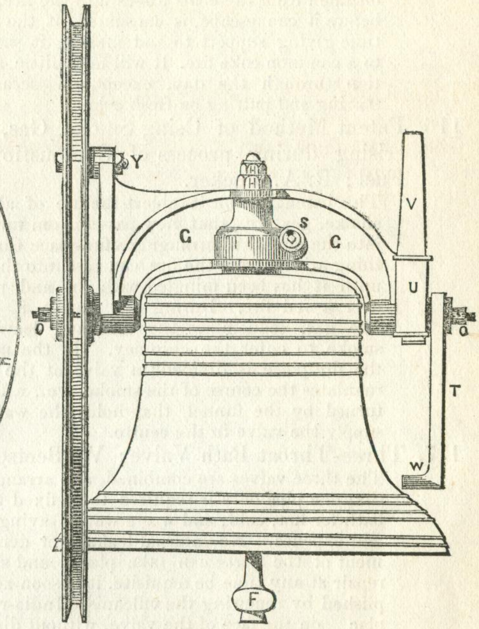
This shoe is proposed to be used in place of the ordinary shutter bar.

130. Patent Self-Closing Lever Tap or Waste Water Preventer; G. Davis.

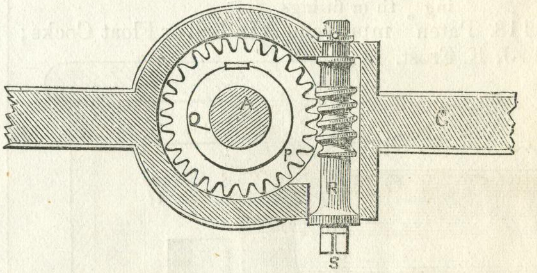
131. Patent Closet Apparatus for Cottage Purposes; G. Davis.

132. Models of Bells, &c.; W. L. Baker, C.E.





No. 1. A model of a 40-cwt. bell and gear, constructed to show the ordinary method of hanging a bell used for ringing. No. 2. A model of a 40 cwt. bell and gear showing the exhibitors' patent improvements, which render a bell and its gear more simple, durable, and easily rung than when cast and hung on the ordinary plan. A circular top or axis is cast on the top of the crown, instead of the ordinary ears or canons. This renders the bell capable of being turned round with great ease, in order to present at intervals the whole circumference of the sound-bow to the blows of the clapper or hammer, and thereby prevent the bell being thumped into holes and prematurely destroyed, as is ordinarily the case. A medal was awarded to Mr. Baker at the Paris Universal Exhibition for these improvements. No. 3. A fragment of a bell that has been hung in the ordinary way, showing the indentation made by the clapper. (Vide *Civil Engineer and Architects' Journal*, March, 1856.)



PHILOSOPHICAL INSTRUMENTS, AND NAVAL AND MILITARY MECHANISM.

135. Instrument and Apparatus for Registering and Showing the Course and Distance run by a Ship at Sea; W. D. Gray.

There is a fan revolving in the water with a velocity proportionate to that of the ship, and communicating motion to a meter. This meter, being so acted upon, deposits shot, in proportion to its velocity, into a tube fixed upon the magnetic needle. By this arrangement the shot are distributed into cells, which represent the quarter-points of the mariner's compass, and the shot always fall into the cell allotted to the point in which the ship is sailing. From the cells the shot are conveyed, by flexible tubes, to an equal number of bags suspended to the circumference of a disc, which disc, like the magnetic needle, is poised on a pivot, so as to allow it to incline or dip in any direction; and according to the direction in which it inclines so will the course of the vessel be; and according to the force with which it inclines so will the distance be. This force is ascertained by placing a weight at the point exactly opposite to the point of inclination sufficient to balance the disc and the steelyard (one end of which revolves on a pin at the centre of the disc, and the other is free, so as to enable it to be turned round to any required point) for the purpose of facilitating this operation of weighting. When the apparatus is only used as a tell-tale to show the course in which the ship has been steering, the fan can be dispensed with and motion given to the meter by means of clock-work. The fan also acts in the water as a vane to obtain the correct motion of the ship when she is making lee-way, and communicates a horizontal motion to the cells, which has the effect of always bringing the cell that is in a line with the ship's true course to the magnetic needle, instead of the cell which represents the head of the ship, and the distance can be obtained with Massey's Patent Log by proportion.

136. Improved Variation and Azimuth Compass; Mathiesen and Ritter.

Notwithstanding the improvements lately made in the art of navigation, many imperfections still remain, and one of the most serious difficulties exists in finding the amount of variation of the magnetic needle frequently, easily, and with exactitude. It may be affirmed that a large number of shipwrecks take place annually due solely to errors of the compass. This instrument affords even to the uninstructed mariner a mechanical and practical means to ascertain, without any calculation, in a few seconds, in any part of the globe, the exact amount of variation in the magnetic needle, and simultaneously the true north. With the aid of the lens this instrument can be used effectively, even when the sky would not admit of observations with other nautical instruments or when the sun is clouded. In this instrument there is a glass cylinder provided with a brass bottom and fittings. At the lower part of this cylinder is a compass-card with its magnetic needle, and on the external part is fixed or engraved a small vertical arrow, the head of which points to the lower part of the apparatus. At the upper part of the cylinder is secured a brass plate, on which is fixed an immoveable card, on which the engraved line runs exactly from north to south, so that the north point is perpendicular with the vertical arrow before mentioned. Above this card is placed a small and very thin straight brass blade, which is fixed in a groove (in a brass ring), exactly in the middle of the north point, and extending to the south. This blade is provided with a hinge, in order to raise or lower it. The cover of the cylinder is fitted with a lens which concentrates the light on the immoveable card when the sun is clouded. In bright weather the lens is not required. A flat brass ring encloses the cylinder, to which it is fixed by means of two brass pins or pivots, upon which it oscillates. The arms of a brass frame support the compass by means of thumb-screws passing through the arm or support of the ring, and fitted loosely in the latter so as to allow the cylinder to have an oscillating motion. This frame is provided with a pivot working in a brass fitting in the compass box. In order to ascertain if the magnetic needle indicates correctly, or if there is any variation, the instrument is placed exactly at midday, so that the north point of the magnetic needle corresponds with the point of the vertical arrow above mentioned. If in taking the meridian, the shadow of the blade falls perpendicular with the engraved line on the immoveable card, then the compass is correct, and there is no variation; *but if*, on the contrary, the shadow of the blade *falls* on either side of the line on the immoveable card, then the instrument must be made to revolve on the pivot until the said shadow falls correctly on the said line, in which case the amount of variation of the magnetic needle from the point of the vertical arrow (the true north) is registered by the number of degrees between the north point of the needle and the vertical arrow.

137. Patent Ships' Compass and Ships' Course Indicator; J. Boyd.

This contrivance consists of a metal ring fixed to the top of the compass, with the points of the compass legibly shown on it; the ring revolves horizontally, and the register is moved to any point which a ship may be ordered to steer by a key, which of course would be in the possession of the captain or officer of the watch. The course of the ship being thus indicated, any deviation could be immediately detected; it would, moreover, be impossible for any misunderstanding to arise as to instructions for steering, as the register would always speak for itself. The course-indicator would also be found valuable in recording the ship's course in cases of accident, the investigation of which frequently leads to conflicting statements on this important point. Not the least of the merits of this ingenious invention is that it can be easily applied to any compass in use, and at a very trifling cost. (See *Shipping Gazette*, 17th August, 1855.)

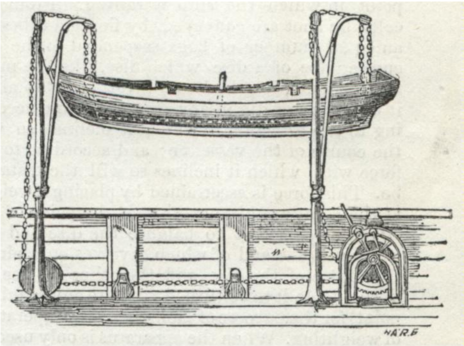
137a. Mechanical Bucket for Drawing up Specimens of Water from moderate or any given depth at sea while the ship is under weigh; James Winter, jun.

This bucket is made of wood, so as not to affect the water enclosed. The bucket is lowered and raised by a cord attached to the valve, which is in the centre of a basin-like lid. When at the depth from which the water is to be drawn, the valve-cord is released, when the water freely enters the bucket, the bucket itself being suspended at the time by means of a second cord.

138. Patent Sounding-Log; Capt. E. Pécoul. Exhibited by A. Tolhausen.

This log serves to rate the rapidity and the direction of currents, to measure the distance run by the vessel with more accuracy than with the log now in use, to warn one of the vicinity of land, and lastly to sound without being obliged to stop the ship's way. The instrument consists of a small copper buoy, capable of supporting a weight of 3 Kilos; its form is that of a triangular pyramid, having for a base an equilateral triangle; the sides are convex isosceles triangles. At the top of the pyramid a pulley is fitted, through which the log-line passes, having the lead attached to one end of it. When it is used for measuring the ship's run, the distance of the lead from the buoy is optional; that is to say, it may be increased or diminished according to the desire of ascertaining with more or less precision the distance run, or as the land may be more or less near. This having been determined upon, a small piece of wood is introduced between the strands of the line, which stops it at the length required against the side of the pulley. About 80 centimetres from the piece of wood a cork is placed, destined to receive a pin having an eye that it may run freely on a cord, attached to two of the angles of the base of the pyramid. When the operation is terminated, and the log hauled on board, the pin detaches itself from the cork, and the buoy coming in horizontally offers little resistance. In supposing that the current is as strong at a certain depth as it is on the surface of the water, which is not probable, as it is generally the wind which is the cause of it, it is evident that the lead, offering little hold on account of its weight, cannot be carried away by the current, as is the case with the buoy which is entirely submitted to its influence, and that it ought, in consequence, to force this last to remain more steady than if it were abandoned to itself; but if, on the contrary, the sea is more tranquil at a certain depth than on the surface, as one is taught to believe, the buoy will naturally remain more steady, and will give a more correct estimate of the distance run than the common log. If the approximate rapidity of the current is required (about one-fifth by Capt. Pécoul's experiments) it suffices to throw the common log along with the sounding-log, and the difference will give it; if its direction is wanted, calculate the difference of the angles formed by each line of the log and the keel of the vessel. The rapidity, as also the direction of currents cannot be exactly measured at sea, as the buoy is not quite fixed, but Captain Pécoul thinks that a long use on board Government ships, where there is a numerous crew, will discover the errors arising from its want of stability. In those latitudes where there is not much depth of water, the Sounding-Log can be advantageously used, care being taken to give the line more length than the presumed depth; it is then understood that, the lead resting at the bottom, the buoy would be quite stationary, and give a correct estimate of the distance run, thus doing away with the necessity of sounding frequently. As a means for measuring the distance run, the Sounding-Log gives satisfactory results; but it is more as a sounding-line, and for approaching land without being compelled to stop the ship's course in foggy weather, or of a dark night, that Capt. Pécoul considers it advantageous for the Navy in general, and above all for steamers, (the noise of the machinery preventing the breaking of the sea on shore from being heard), which are lost where probably a sailing vessel would have been saved.

139. Patent Lowering and Disengaging Apparatus for Ships' Boats; G. F. Russell. Exhibited by Troughton and Bevan.



In this plan the boat rests her whole weight upon two keel cranes; the act of lowering immediately disengages her from them without hoisting the boat, and at the same time projects the boat several extra feet from the ship's side, and as both the pendants, after passing over the heads of the cranes, lead to one barrel of the winch, both ends of the boat must be lowered together, and when near the water, one man can instantly disengage her fore and aft by a lever. One end cannot be freed without the other, as a rod which passes between the keel and keelson plank is connected with the lowering apparatus at both ends. The winch is placed flush with the staunchions inside the bulwark, thus occupying no space on deck. It is fitted with a break. One hand on board can lower a boat full of people, or by a lanyard attached to the handle of the break, a man in the boat can lower it, however weighty, and regulate its descent without any one remaining on deck. The same tackle is always available to hoist the boat, and the winch being placed at a distance from the cranes, which turn in board, the boat can be easily brought on deck.

140. Ribbed Anchors; — Firmin. Exhibited by Robertson, Brooman, and Co.

The object of this method of constructing anchors is to reduce their cost by disposing the material of which they are formed in such manner as to produce, with a given quantity of metal, a strength equal to that of an ordinary anchor of much greater weight; and also to increase their portability by making them in separate pieces, which may be combined or taken apart at pleasure. Both the shaft and arms, or either, are formed by combining several ribs or plates so as to leave cells or open spaces between them, or by first forging those parts solid, and afterwards cutting grooves out of them by rolling, forging, or any other means. Fig. 1 represents an anchor with moveable palms; Fig. 2. an end elevation of the same; and Fig. 3, a view of the shaft detached from the palms and arms. A A is the shaft or shank, which is forged of the cellular shape represented by the section in Fig. 4, with the bosses B and C solid, for the purpose of having holes drilled through their centres for the reception of the ring-bolt, D, and stock, E. The lower end of the shank is also forged solid, and afterwards slotted out in the manner shown, and drilled, in order that it may be fitted into corresponding recesses or slots cut through the crown part, F, of the arms, G G, where it is secured by a strong bolt, H, upon which the shaft is free to turn as upon a centre. Sometimes the shaft is formed of two, three, or more plates of iron, rolled with or without a rib on each side, except at the parts B and C, and the lower end, which are left of an increased thickness. The shaft and arms are formed of T-iron, or of angle iron, or of a combination of these, firmly riveted, welded, or bolted together. G G are the arms, formed also cellular, as indicated by the section in Fig. 5, taken through the arm at *a a*, by either forging them out of the solid, or by welding, riveting, or bolting plates of angle or T-iron, or plates rolled with a rib on each side. K K are the flukes, which are formed separately, and then welded or otherwise firmly secured to the arms. L L are the spurs, which are also forged separately, and welded to the arms. (See *Mechanics' Magazine*, August 12, 1854.)

Fig. 1. Fig. 2.

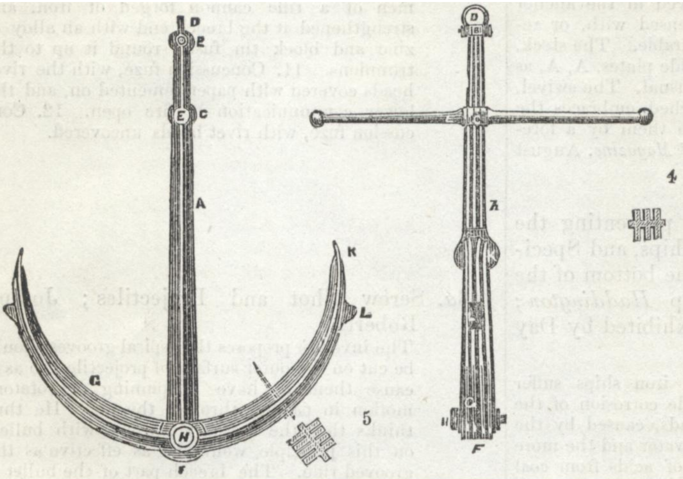
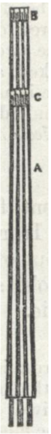


Fig. 3.



141. Anchors; — Scott. Exhibited by Robertson, Brooman, and Co.

In these anchors, with a given quantity of metal, greater strength is said to be obtained than in the ordinary construction; while the parts of the anchor are so formed and combined that they may be easily forged, and readily put together or taken to pieces, in consequence of which they are portable, and capable of being stowed with convenience. Fig. 1 represents a side view of an anchor constructed with a filling piece of wood, as above described. A A are the side plates, and B is the wooden filling piece of which the shank is composed; C C are the arms of the anchor. The shank, A, B, A, is in this case united to the arms, C C, by two forelocked pins or bolts, *a a*. D is the metal collar, which embraces the plates, A, A, and the filling piece, B, for the purpose of combining them more effectually. A metal brace, E, attached to the other end of the filling piece, B, has formed in it a hole, through which, as also through the plates, A, A, the stock, F, passes; this stock being forelocked in the usual manner. The swivel, G, to which the cable is attached, is embraced by the two plates, A, A, and united to them by a forelocked pin, *b*.

Fig. 1.

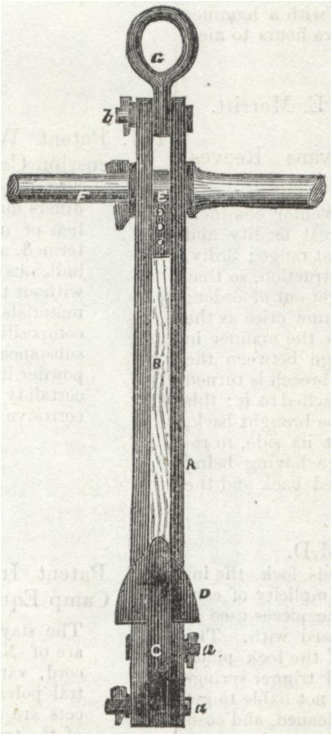


Fig. 2.

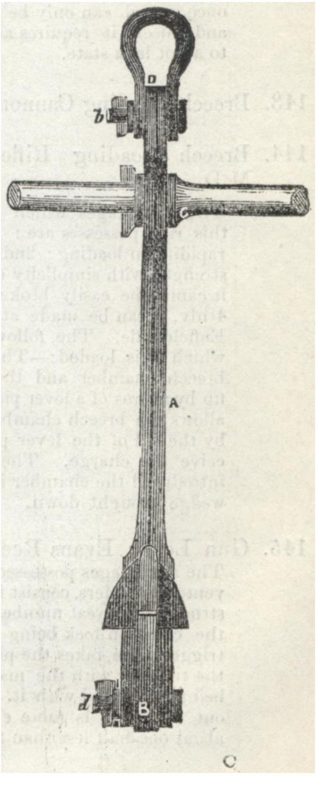


Fig. 2 represents a side-view of another anchor, in which the side plates of iron are kept partially apart, by means of suitable enlarged portions of the plates themselves, this arrangement being preferred to the former. A, A, are the two side plates, and on these are formed the projections, *a, a*, which come together at the middle line of the shank; B B are the arms of the anchor. The shank, A, A, is in this case united to the arms, B, B, by a single forelocked pin or bolt, *d*, about which the arms are intended to turn, as in Porter's and other anchors. In this case the metal collar employed in the anchor first described may be dispensed with, or retained, as is considered desirable. The stock, C, passes through the two side plates, A, A, as shown, and is forelocked, as usual. The swivel, D, to which the cable is attached, embraces the side plates, and is united to them by a forelocked pin, *b*. (See *Mechanics' Magazine*, August 25, 1855.)

142. Patent Marine Cement, for preventing the inside Corrosion of Iron Ships, and Specimen of Plate taken out of the bottom of the P. & O. S. N. Co's. ship *Haddington;* Westwood and Baillie. Exhibited by Day and Co.

After a few years' running, iron ships suffer serious injury from the inside corrosion of the bottom plates and rivet heads, caused by the perpetual action of the bilge-water and the more destructive chemical action of acids from coal dust, urine, salt, sugar, guano, &c. This cement prevents corrosion, supersedes painting, and lessens future repairs. It consists of a mineralised substance or enamel, and will not absorb moisture, is not inflammable, resists acids, and, once coated, can only be got off with a hammer and chisel; it requires about five hours to melt to a hot lava state.

143. Breech Loading Cannon; T. E. Merritt.

144. Breech Loading Rifle; Evans Reeves, M.D.

The advantages which the inventor considers this rifle possesses are: 1st, great facility and rapidity in loading; 2ndly, great range; 3rdly, strength with simplicity of construction, so that it cannot be easily broken or get out of order; 4thly, it can be made at the same price as the Enfield rifle. The following is the manner in which it is loaded:—The wedge between the breech chamber and the false breech is turned up by means of a lever piece attached to it: this allows the breech chamber to be brought back, by the aid of the lever piece at its side, to receive the charge. The charge having being introduced the chamber is carried back and the wedge brought down.

145. Gun Lock; Evans Reeves, M.D.

The advantages possessed by this lock, the inventor considers, consist in its simplicity of construction, a great number of the pieces used in the common lock being dispensed with. The trigger plate takes the place of the lock plate, the tumbler with the main and trigger springs being connected with it. It is not liable to get out of order, is more easily cleaned, and costs about one-half less than the lock now in use.

146. Projectiles, &c.; Capt. Norton.

1. Specimen of liquid fire, rifle shell, rifle cannon. 2. Improved alarm railway signal. 3. Bolt for vertical fire, to dislodge troops under cover. 4. Explosive percussion bolt signal for railways. 5. Bolt for conveying liquid fire, to set ship's sails on fire. 6. Cartridge charged with gun-cotton and fulminating mercury. 7. Glass tube igniter, for the interior of the fog alarm signal. 8. Blasting cartridge, charged with gun-cotton and fulminating mercury. 9. Fire shot, to be discharged from an air or steam gun. 10. Specimen of a rifle cannon forged of iron, and strengthened at the breech end with an alloy of zinc and block tin fused round it up to the trunnions. 11. Concussion fuze, with the rivet heads covered with paper cemented on, and the lower communication of fire open. 12. Concussion fuze, with rivet heads uncovered.

146*a*. Screw Shot and Projectiles; Joseph Roberts.

The inventor proposes that spiral grooves should be cut on the outer surface of projectiles, so as to cause them to have a spinning or rotatory motion in passing through the air. He thus thinks that the ordinary musket, with bullets on this principle, would be as effective as the grooved rifle. The breech part of the bullet is made separate, and of the same diameter as the bore of the piece, but without being grooved. The point is a little more elongated than the ordinary minié bullet.

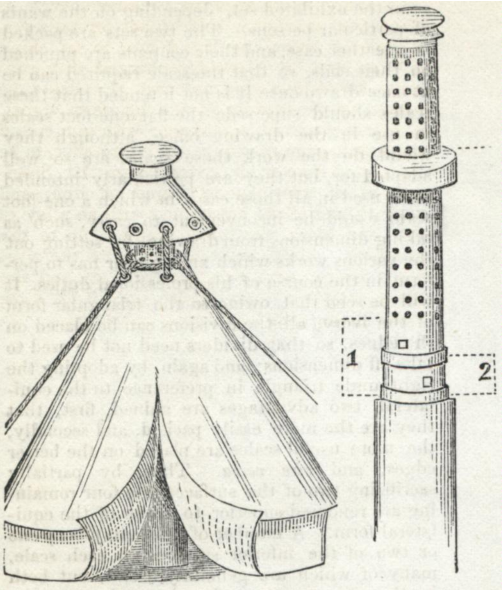
147. Patent Waterproof Anti-Corrosive Percussion Caps; F. Joyce.

The principle on which these caps are made differs materially from any hitherto adopted. In lieu of metallic foils or linings, as they are termed, and other substances of an equally injudicious character, which cannot be consumed without the introduction of the most corroding materials, these patent caps have their detonating composition covered with a highly waterproof substance, burning with as much facility as the powder itself, and in no degree detracting from certainty and sharpness of fire, as well as anti-corrosive property.

148. Patent Improved Tents, Marquees, and Camp Equipage; G. Turner.

The stays or framing for supporting the covers, are of Newall's patent or other galvanised wire cord, variously arranged and fitted to the central poles or tubes. For sleeping, hammocks or cots are slung from the stays to the centre pole of the tent, so as to be well off the ground.

149. Patent Ventilator for Tents, Huts, or Buildings; C. Marsden.



150. Patent Methods of Casting Shells and other Hollow Bodies; R. Mallet.

(See *Newton's London Journal*, March, 1856.)

151. Folding Portable Bridge; M. Lavanchy.

The principle of this system is that of the "lazy tongs." This bridge is specially adapted for military use, as it may be placed when wanted on the edge of a ditch, rampart, &c., for the passage of troops. It may be used as a means of embarking or disembarking when ships are unable to approach the shore.

152. Double Folding Fixed Bridge; M. Lavanchy.

A fixed bridge on the same system, with double roadway for carriage and foot passengers.

153. Folding Portable House; M. Lavanchy.

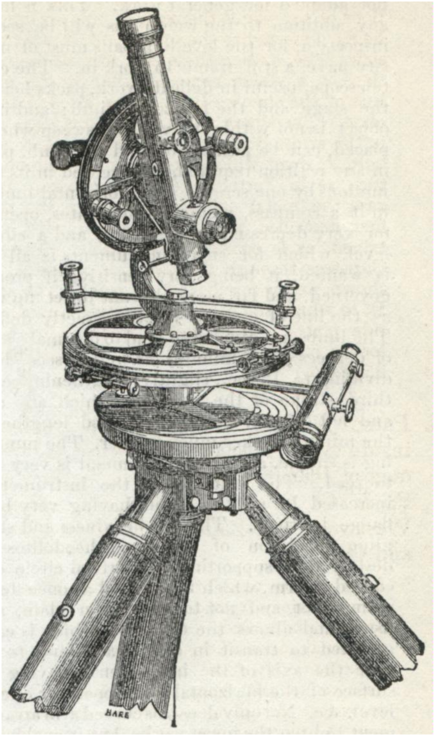
Houses on this principle are adapted for barracks, hospitals, stores, &c.

154. Folding Shutters for Shops, &c.; M. Lavanchy.

The same principle applied to shutters for shops.

155. Folding Bedstead, on the same Principle; M. Lavanchy.

156. Improved Theodolite; W. E. Metford.



This theodolite has been designed to supply the defects and wants found in the instruments at present in use, the chief of them being (to begin with the lower parts), the instability of the leg-joints after a moderate amount of wear, with no proper compensation for that wear; the unsatisfactory condition of the present methods of levelling the instrument; the inability of the observer to adjust it over the centre point without moving the legs; the necessity of two bubbles on the vernier plate; the weight and the straggling condition of the whole; the unnecessary size of the telescope compared with its power of limb; and the top-heaviness of the upper works. These and other minor defects have given rise to this instrument, in which they have been overcome, either by original additions, or the application of those parts of other instruments which were suited to meet the case. In this theodolite the leg-heads have trunnions, which give great stability, and their wear is compensated by tightening gear. The levelling apparatus is combined with the traversing stage above it, which forms the base for the balls of the three levelling screws to work on; the increased distance between the balls, when they are out of parallel, is accounted for by the hollow screws being at the ends of a triangular plate of well-hammered brass, having a slight spring in it; the wear of the screw is provided for, so that no instability is induced by such wear. The traversing stage above the levelling apparatus enables the observer to move the upper instrument one inch in any direction from the centre, after the legs are firmly planted. This stage consists of a hollow circular box, with a hole in the under side to let the plumb line follow the instrument, and with a hole in the upper surface to let the main hollow centre pass. This hollow centre has a circular foot of a larger diameter than the upper hole, and not so large as the box. This foot can, therefore, be moved in any direction on the box, until it touches the side, and can be fixed in any position rapidly, by a three-armed screw, revolving on the hollow centre, and pressing on a washer that covers the upper hole, which washer also serves to keep out the dust. This stage is clearly a great addition to the value of the theodolite, particularly where the instrument requires to be set up often, for it has been found that much time is lost in the getting it over the required position correctly, keeping the instrument nearly level and firm as well. Stages have been used before in a few instances, but as a separate and bulky apparatus, not adapted for general work. This is hardly any addition to the weight, as will be seen on inspection, for the levelling balls must of necessity have a stiff frame to work in. The check telescope, useful in delicate work, packs between the stage and the horizontal limb; and if the object is not within its vertical sweep when so placed, can be pushed beyond the limb, placed in any position required, and secured in its three motions by one screw. The horizontal limb has in it a compass, memorandum slates, openings for very depressed angles (70°), and a circular level, which for small instruments is all that is wanted, it being very sensitive if properly governed, and far more pleasant to set up with, as the line of error of level is exactly defined. The limbs are divided to read to decimals, either of degrees or of minutes, as well as seconds, by dividing to 12 sec., slightly lengthening every third stroke of the verniers, which are right and left (36 sec. = ·01 deg.), and lengthening the minute strokes much further. The numbering is simple, and the arrangement is very easy to read. The stability of the instrument is increased by all the pivots having very broad flange bearings. The top-heaviness and straggling condition of common theodolites are destroyed by supporting the vertical circle on a curved T-arm, which is attached at once to the main pivot, and not to the vernier plate, as is usual, and allows the telescope, which is easily adjusted to transit in a vertical plane, to pass over the axis of the instrument, leaving the surface of the horizontal limb open for circular level, &c. Not only does this curved arm arrangement lighten the upper works, but it enables the observer, with the rectangular eyepiece, to work from one position unobstructedly. This eyepiece is a great convenience in many situations, a necessity in tunnelling, and in using this instrument as an altitude and azimuth, which it is exceedingly well adapted for. There are for this purpose, a little ball reflector before the object-glass, which will be found to light the cobwebs most successfully, and a very long level attached to the vertical limb. The object-glass defines sharply to its edge, and the optical power of the telescope is ample for an instrument of this size, as it will show a line 3 sec. in angle. The centre of the weight of the upper works is so little from that of the instrument (¼ inch), that it has not been found necessary to put on a counterbalance, but a long bubble could be easily attached to do that duty, and to check the axis of the vertical circle more directly. There are ball targets with double milled leads, improved diaphragms, improved method of fixing telescope to its seat and pivot, of mounting the object-glasses in eye-pieces for the easy removing of dust and rain, of fixing the long level, of securing and carrying the instrument in its box, &c. The designer considers that a five-inch theodolite is amply large enough for general work. This instrument was built much larger, for his own particular requirements, by Mr. T. D. King, of Bristol, to whom the designer is indebted for some valuable suggestions in detail, and whose accuracy in following drawings is only equalled by his very excellent work.

157. Double Set of Pocket Scales for Engineers, Architects, and Surveyors; W. E. Metford.

The length of each of these scales is six-inches. The section of a single scale is a right-angle triangle, and two make a square and set, the tenth scale forming one set, and the twelfth the other, so that they may be had separately or as in the exhibited set, depending on the wants of particular persons. The two sets are packed in a leather case, and their contents are punched on their ends, so that the scale required can be at once drawn out. It is not intended that these scales should supersede the flat one-foot scales in use in the drawing office, although they would do the work those scales are so well adapted for, but they are particularly intended to be used in all those cases in which a one-foot scale would be inconvenient to carry, such as taking dimensions from drawing, for setting out the various works which an engineer has to perform in the course of his professional duties. It will be seen that, owing to the triangular form of the ivory, all the divisions can be placed on the edges, so that dividers need not be used to take off dimensions; and again, by adopting the right-angle triangle in preference to the equilateral, two advantages are gained, first, that they are the more easily packed, and secondly, the more useful scales are placed on the better edges, and *vice versa*. Thus, by partially sacrificing two of the surfaces, the four remaining are rendered superior to those of the equilateral form. A number of constants fills up one or two of the inferior surfaces on each scale, many of which are generally useful, but both in the arrangement of scales and constants, variation can be made to suit particular wants.

158. Improved T square; Stanley and Robinson.

159. A Centre of Gravity Thermometer; J. G. Appold, F.R.S.

This thermometer is made by riveting together a plate of zinc and one of steel. The bar so formed is suspended vertically on a knife edge, near the centre of its length, having a pointer at its upper end traversing in front of a graduated arc. When this bar is at an angle of 65 degrees, the centre of gravity being a very little below the knife edge, if the temperature rises, and causes the plates to bend, the centre of gravity is thrown on one side, and the bar is moved through a proportionate arc. The pointer being formed as a male screw, having a nut working on it to adjust the instrument, it is only necessary so to place the nut, that the pointer moves one inch, with a variation of one degree. At the other end of the bar there is another screw, by which the bar can be set vertical at any temperature that may be required. This was invented for use in a dining-room, so that it could be seen at a distance whether the temperature was above or below 65 degrees. There is a weight to hang on the bottom, which lowers the centre of gravity so much, that it takes ten degrees of heat to move the pointer over one one inch of the graduated arc.

160. Self-Regulating Dynamometer for ascertaining the power exerted by manual labour or a steam-engine; J. G. Appold, F.R.S.

In this instrument the power exerted is ascertained by simply placing a weight on the lever, which weight represents the amount of force the prisoner will have to exert during the whole revolution of the handle. Uniformity of friction under all circumstances, whether the machines be well oiled or dry, and in all positions of th balanced handle, is obtained, thus enabling a man to turn for any length of time without variation of effort. Other machines, when set to a resistance of 12lbs., have required a force of 50lbs. to start them, and materially vary when they become dry or warm. This uniformity of friction is obtained through the medium of a weight connected with the jointed break, which weight, whilst the machine is in motion, is lifted according to the resistance it receives, thereby altering the grip of the machine; thus, when the machine is cold, fresh oiled, or driven slowly, it will not rise and liberate the grip so much, but should there be any increased friction, from want of oil or any other cause, the weight will immediately rise and liberate the grip exactly so much as will neutralise the effect produced by this cause. The cylinder, or barrel, contains a small quantity of water with a metal plunger, which effectually prevents any vibration in the machine from rough usage. Its action is thus:—The plunger, not being made to fit quite close to the barrel, only permits the water to pass slowly from one side to the other, thereby offering a resistance to any sudden change in the position of the plunger, because, to lift the column of water the column of air must likewise be lifted, and as the area of the plunger is about 20in., a force equal to 300lbs. would have to be exerted; consequently, as the space between the barrel and plunger is small, it perfectly resists any sudden alteration in the position of the plunger, although not offering any resistance to the plunger being moved slowly, it being merely suspended in the water, and not touching the barrel, or cylinder. The means of ascertaining the precise amount of labour performed, is to multiply the weight in pounds by the circumference described by the handle in feet, and then by the number of revolutions per minute. The product will give the number of pounds raised one foot high per minute. Discretion must, of course, be used as to the amount of labour with which the prisoner is to be tasked, which entirely depends upon the health and strength of the individual, and the time he is to be employed. Fifteen thousand revolutions have been found to be the average amount of work per day for an adult in good health.

161. A Reflecting Microscope and Artist's Enlarging and Reducing Mirror; William A. Guy, M.D.

This instrument combines the advantages of a microscope of low power for universal use, with those of enlarging and diminishing natural objects and pictures for the use of the artist.

161*a*. Patent Photo-Galvanography; The Patent Photo-Galvanographic Company.

The leading feature of this invention is the production, from a photographic original, of an engraved surface suitable for copper-plate printing or other purposes. A new mode and style of engraving, producing a tint resembling aquatint, results from plates made from photographic originals. The colour of photographs is sometimes liable to change, and in several copies from the same negative there is a lack of uniformity in the *shade* of colour. By the new process this uncertainty of colour is obviated, inasmuch as the prints from the plate are made with ink, and require only the attention of an ordinary printer to keep them of uniform colour

162. Portable Photographic Camera; J. Mawson.

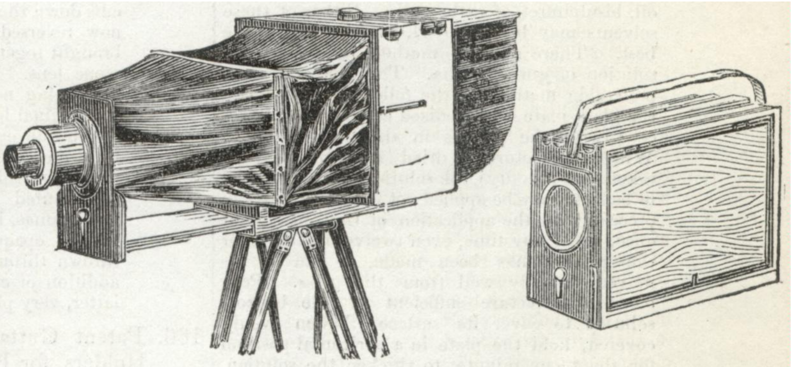
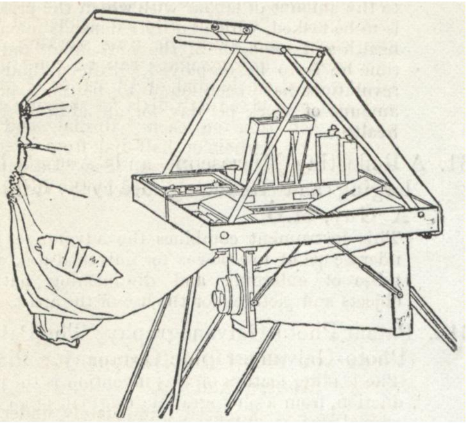


Figure 1 of the accompanying engravings shows the camera unfolded. The base consists of a slide and sheath. The slide bears a bracket, to which the lens is attached by means of a sliding front. The sheath carries the main frame, which is grooved, either for 1 or 2 dark chambers, and the focusing glass. The body is composed of strong leather-like cloth, both light-proof and water-proof. One end of the body is fixed to the main frame, and the other is connected with the lens by a conical tube of pliant cloth, the neck of which is elastic, and contracts over a collar behind the lens. The projection at the back of the instrument shows the focusing tablet, with a shutter for its protection, and a screen which supplies the place of the ordinary focusing cloth. Fig. 2 represents the camera folded. Folding is effected by first detaching the cloth tube from the lens, and packing it with the body in the space between the dark chamber and focusing glass. The slide is then screwed in, and, when released from the detent in front, the main frame is turned square with the base.—See *Mechanics' Magazine*, March 8, 1856.

163. Patent Portable Photographic Camera; John C. Bourne.

This camera has a separate dark chamber, wherein the whole negative process may be performed out of doors, with arrangements for obtaining increased definition of the picture. To render the instrument more portable, it is so arranged that the box wherein the camera, together with the other requisite apparatus, is packed, shall serve as a foundation for the instrument when in use. For the purpose of focusing the instrument for objects of varying distances forming part of the same picture, the lens end is made to travel on a curve, whose radius is proportioned to the focal length of the lens for the objects to be taken, the slide holder having also a perpendicular and horizontal movement on its centre. The camera being adjusted on the lid of the packing box (the latter supported as usual on a tripod stand), the lid is thrown open, leaving the adjusted camera suspended therefrom, whilst the preparation of the plate, &c., is effected in the manipulation chamber, which is formed by raising the laths fixed inside the box, and throwing over them a cover of cloth, with suitable holes for the head and hands of the operator, as shown in the accompanying drawing,



in which the near half of the covering is removed, to show the disposition of the apparatus inside. The covering being stripped off, the laths depressed, and box shut, the adjusted camera is ready for exposing the plate. The same is repeated for the development of the plate. (See *Journal of the Photographic Society*, January 21, 1856.)

*164. Patent Process for Removing Collodion Pictures from the Glass; F. S. Archer.

The material employed is gutta percha. This substance is soluble in benzole, chloroform, coal oil, bisulphuret of carbon, &c. Either of these solvents may be employed, but the first is the best. There are two methods of using the solution of gutta percha. The first and most preferable method is the following:—Prepare the glass plate with iodized collodion, and proceed with the process in the usual manner. When the picture is dried (and care must be taken that it is dry), the solution of gutta percha in benzole may be applied; it is not necessary to proceed with the application of the solution at once, as at any time, even twelve months after the picture has been made, it can be removed equally well from the glass. Pour on to the picture sufficient of the benzole solution to cover its surface. When evenly covered, hold the plate in a horizontal position for about one minute, to thicken the solution, then very gently drain off through a funnel into the bottle again, the excess, gradually raising the plate vertically over the funnel; the benzole will rapidly evaporate, leaving on the picture, and in intimate connexion with it, a transparent covering of gutta percha. After draining for about half a minute, the back of the plate must be held before a clear fire, to accelerate the hardening of the gutta percha film, and to prevent its chilling on the surface. If the gutta percha does not give a sufficiently thick coating to the picture on its first application, it may be applied again after the first coating is cold. The plate is now immersed in a vessel of cold water, which very soon causes the combined films to separate in one sheet from the glass; the picture is now dried with blotting paper, and the rough edges are removed with a sharp knife. It is now ready for the printing frame. The polish of the glass is not in any way impaired by this process; it can be used again an indefinite number of times, if care is taken in cleaning it and preserving its surface from injury. Polished silver plates or slabs of porcelain or slate can be employed to support the collodion; the benzole solution will separate the film as readily from those substances as from glass. The second method is by coating the glass *first* with the benzole solution, then applying the iodized collodion, and proceeding with the process of developing and fixing the picture. The plate is then placed in a vessel of cold water, which causes, as in the preceding method, the two combined films to separate from the glass. One great objection to this method is, that if the collodion picture be not successful, the gutta percha coating is lost, whereas, in the first method, the gutta percha solution is only applied to perfect pictures, or such as the operator wishes to preserve. Another objection is, the great difficulty in getting the gutta percha film spread on the glass so as to form a surface sufficiently even to receive the collodion film.

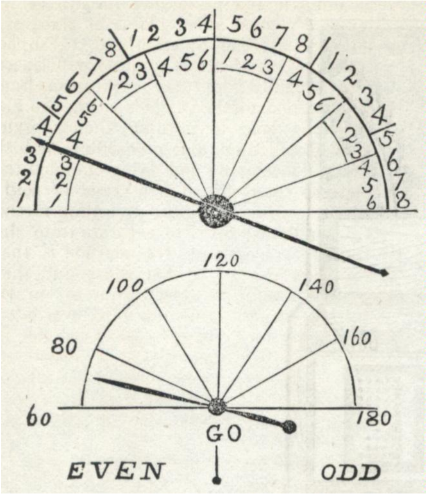
165. Registered Cosmorama Stereoscope; George Knight.

This is a modification of the very popular instrument of Sir David Brewster. The advantages which it affords are, the greater facility with which the double images are made to form one picture, less fatigue to the eyes of the observer, and the ready adjustment of focus to different sights; also, by employing lenses of greater focal length, larger pictures can be viewed stereoscopically. Description.—In place of the two small semi-lense employed in Brewster's Lenticular Stereoscope, the inventor takes a plano-convex lens 3½ inches in diameter, which he cuts down the centre. These two halves, being now reversed, and the outer edges cut and brought together, form the cosmoramic stereoscope lens. The outer diameter of the original lens being now in the centre, and the centre of the original lens being now the outer portion, on which the eyes of the observer are directed, in a measure explains the reason of the superiority of this form of stereoscope. The lens is mounted in a box similar to the French Polyoramas, by which reflected light is directed on the opaque picture, and transmitted light thrown through the transparent ones. By the addition of coloured cards placed behind these latter, very pleasing effects are produced.

166. Patent Gutta Percha Baths and Fluid Holders for Photographic purposes; Burgess and Key.

167. Patent Music Timekeeper; E. R. Fayerman.

In this illustrative model, music time is thus exhibited. It is seen, by the jump of the hand over the dial, indicated by numerals, marks, or notes; heard, by the vibration tick, and by setting the strike bell to any of the 9 sets of beats from 2 to 48; kept and seen in any music measure, by dividing the dial into the required sections; changed, accelerated, or retarded, without stopping the machine, by moving the regulating hand; stopped, by turning the stop key to the left hand for the even note and to the right hand for the odd note, and a pause thus made on any note and the remainder of a bar proceeded with; set in motion by turning the stop-key vertical; and any slow rate of time obtained by devoting two or more vibrations to a note. In this model, with a dial of 48 parts,

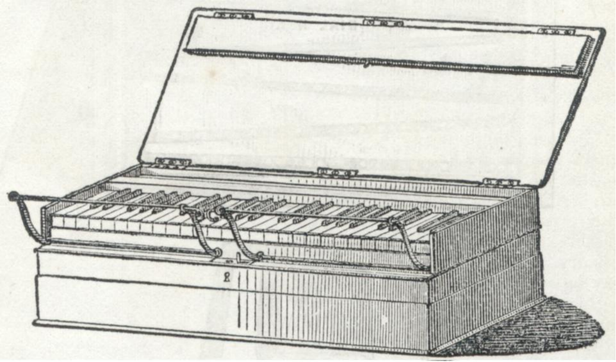


worked with a double-hand on 24 parts, the half-dial method has been adopted for exhibiting music time, thus:—by marks, numerals or notes; by the different measures of 2 to 12 notes in a bar; by music notation in notes; by the several music measures in any kinds of notes; and by the music measures at one view on their respective foundations. By using different compound hands, single bars alone may be shown, and the music measures worked at one and the same time. The dial may be connected with the music, and show the time working with the notes. The machine can be constructed with a fixed whole dial of 12, 24, or 48 parts; and also with fixed half-dials for showing even and uneven time on each half-dial, and for changing on a whole or half-dial from even to uneven time, and the reverse. (See "Description of the Timekeepers" published by the Inventor.)

168. Patent Ne Plus Ultra Damper for Piano-Fortes; Moutrie and Co.

This damper is placed immediately under the hammer, and by means of a spring is kept constantly pressing upon the strings, unless set off by the action of the performer; this position of the dampers gives room for them to be carried throughout the instrument, a desideratum never hitherto obtained.

169. Patent Clavi-accord; L. Gavioli. Exhibited by W. H. Walenn.



The chief difference between an ordinary harmonium and one of these instruments is that in the harmonium the bellows are worked by the feet, and in the clavi-accord by the wrists of the player, thus enabling greater command to be had over the instrument, and greater expression to be given to particular passages. This arrangement also renders the instrument portable, and but little liable to derangement. The connection between the wrist of the player and the bellows is established by means of rocking beams and a set of rods. The wind chest is prevented from being over-charged by causing certain valves to be opened by contact with the bottom of the wind chest when it is distended to its full amount. (See Patent, No, 1,592, July 16th, 1855).

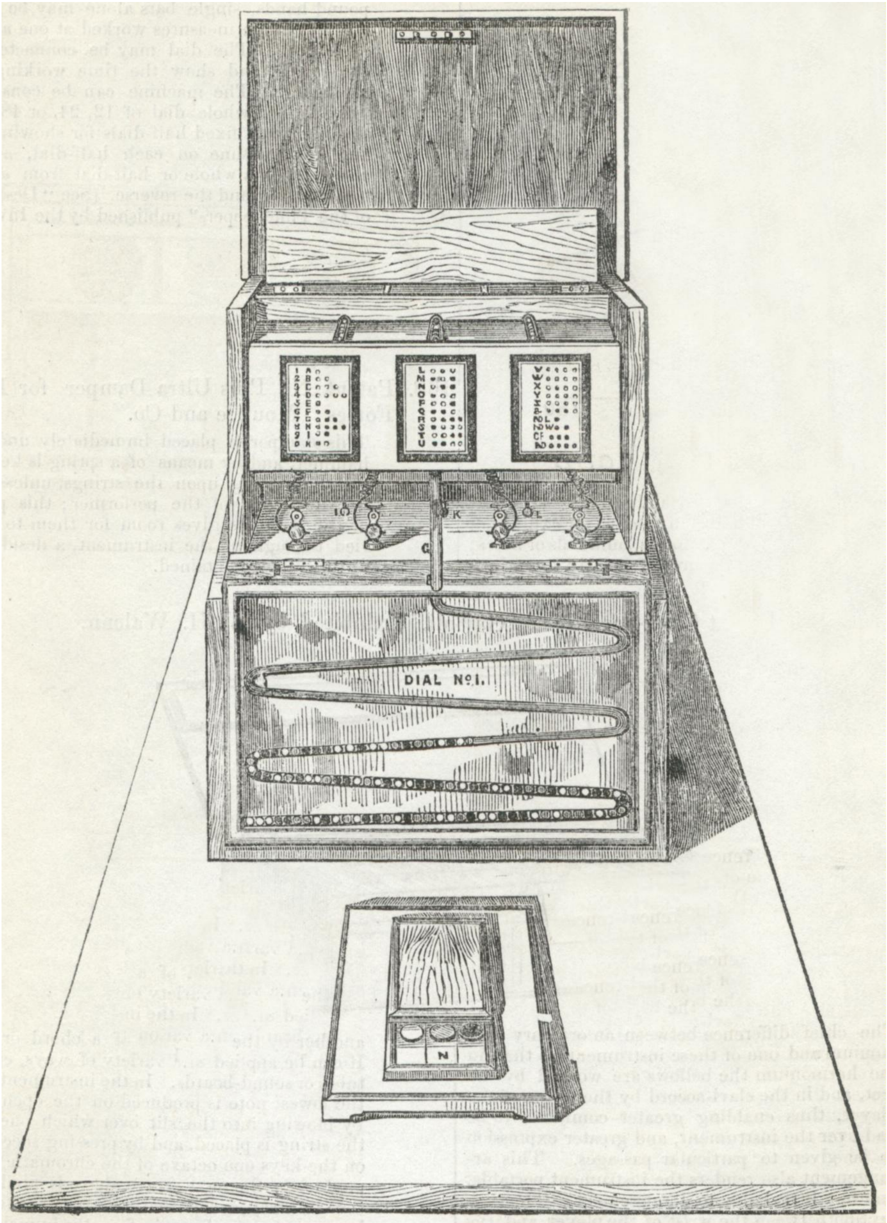
170. Eolian Monochord; F. J. Julyan.

This is a new method of producing musical sounds by interrupting or intercepting the passage of a current of air from one cavity to another by the vibration of a chord or string. It can be applied in a variety of ways, either to tubes or sound-boards. In the instrument shown, the lowest note is produced on the open string, by blowing into the slit over which one end of the string is placed, and by pressing successively on the keys one octave of the chromatic scale is produced; the next octave above is produced in the same way, except that the cavity of the mouth is contracted, making, in fact, the human mouth itself a musical instrument, and the string acts the part of a reed. More than three chromatic octaves may be produced on this instrument. When the string is applied to a tube, the greatest volume of sound is produced by bringing the string and tube in unison or harmony; that is, either the string and tube producing the same note, or its octave, fifth, fourth, third, or sixth.

171. Portable Machine for tuning, arranged to give nine times the power of the hand for fine tuning; E. D. Johnson.

171*a*. The Globotype Telegraph; D. McCallum.

Fig. 1.



This telegraph professes to supply a want which has long been felt in telegraphic communication It must be obvious to all who have made the telegraph a matter of observation, that if the message could be recorded in any tangible form without involving a complication of machinery. or synchronous movements, that such a plan would be sure to supersede the telegraphs which are at present in operation. The leading characteristic of this telegraph consists in releasing small glass balls, and the apparatus is so arranged as to allow them to fall into a groove over a series of inclined planes, when they immediately roll into their proper places by the force of their own gravity. Fig. 1 represents the box open, in which the globotype telegraph is contained; the side of the box turns down, on which is placed dial No. 1. The alphabet is also shown in three panels on the front. Fig. 2 represents the upper part of the apparatus; O, O, O, are the basins which contain the balls by which the message is recorded. The balls are three different colours—white, black, and blue; they pass into three glass tubes, B, B, B,; at the lower end of each of these a detent is placed, E, and Fig. 3, E, E. By the peculiar construction of the

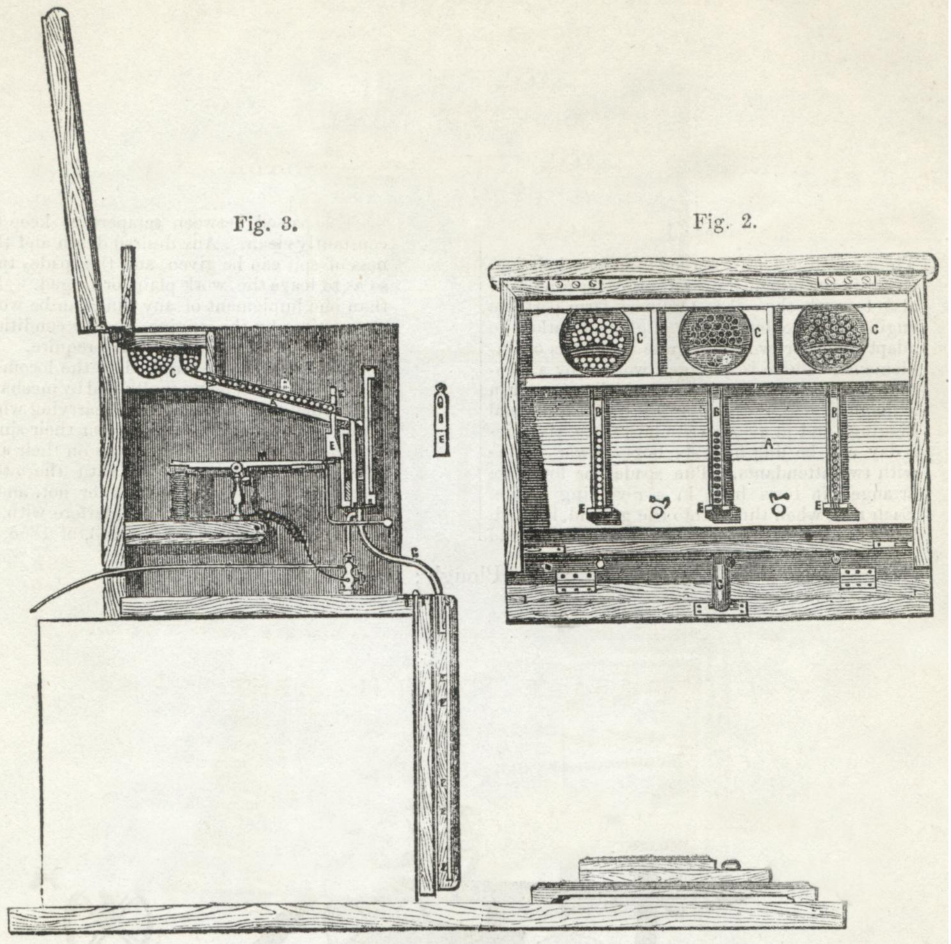


Fig. 3.

Fig. 2.

detent, no more than one ball can possibly be released at once. These balls, multiplied and intermixed, constitute the alphabet: they are thrown out one by one, at the will of the operator, into a receiver, Fig. 3, F; then they pass down an incline into a brass tube, G, through which they fall into the dial, and in this way the message is recorded. The dial is composed of a series of inclined planes, over which a plate of glass is placed. There is no clock-work which requires to be wound up—no pencils to be mended—no paper to be prepared, or the movements of a needle to be watched; there is not a single spring or a wheel in the whole construction, yet the messages are recorded with the greatest certainty, and with as much facility as any other telegraph, and on long distances will exceed most of them, because there is no necessity for the clerk to wait for a single word before he may begin to forward the message, for as soon as a ball makes its appearance in his own dial, he has only to touch a key, Fig. 1, N, (section also shown in Fig. 3), which corresponds with the colour of it, and a similar coloured ball is instantly released at the next station, and this may be continued over any extent of country. The clerk may send the message in this way with greater facility than if he sent it from the written document. In this manner, also, secret communications may be transmitted. It is only necessary to state or write what coloured balls are required to record the message, and the clerk will forward it quicker that he could from a plainly-written paper with which he was quite familiar. This telegraph may be worked with one or two wires, with magnetised bars, or electro-magnets. The model, which is partly represented by the above engravings, is worked on the principle of two wires, but every argument is in favour of one, and one wire is therefore particularly recommended. (See *Artizan*, March, 1856.)

171*b*. Improved Means of Connecting Telegraph Wires; Earl of Caithness.

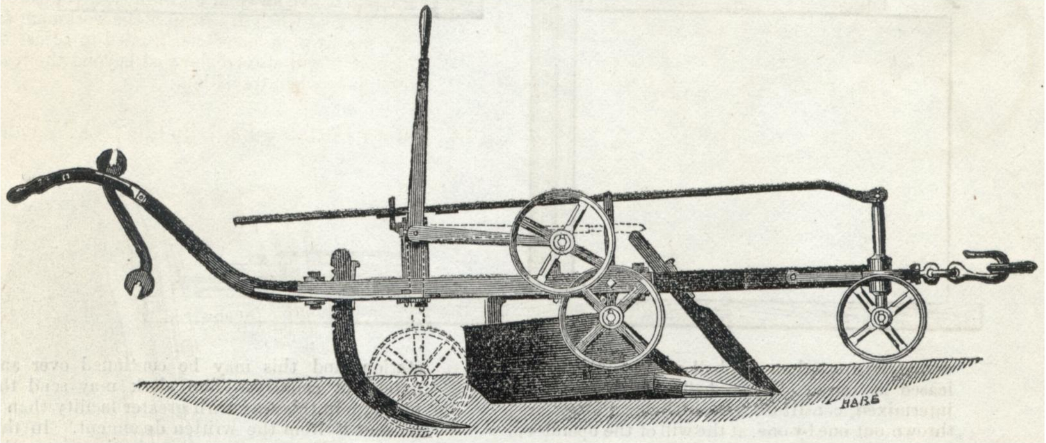
In place of the coil of wire at the point of junction, a flattened tube is soldered over the end of the wires.

AGRICULTURAL IMPLEMENTS AND SADDLERY.

*172. Agricultural Machines; H. W. Ford.

These machines are designed to supersede horse-power in the principal operations of farming, and also to work the soil. Ordinary farm portable engines require but a few slight alterations to adapt them for working these machines or implements. There is a digger, worked by a locomotive, the spades or forks of which are used in a manner precisely similar to that of manual digging; and in average circumstances, six acres a day can be dug by a six horse-power engine with two attendants. The spades or forks are arranged in rows held in a revolving frame. Each row, when thrust into the ground, is lifted has its forks turned over to cast their spits, and is then passed between scrapers to keep them constantly clean. Any desired depth and thickness of spit can be given, and the spades turned so as to leave the work plain or ridged. More than one implement of any kind can be worked at one time by the engine, as the condition of the soil and object in view may require. The slow forward motion required in the locomotive allows of its power being multiplied by mechanical arrangements for acting upon its carrying wheels. These are made broad, to prevent their sinking far into the ground, and are loose on their axles. The front ones are driven with the others, whether they are on the lock or not, and unevenness of surface will not interfere with their running. (See Patent, No. 1,343, of 1855.)

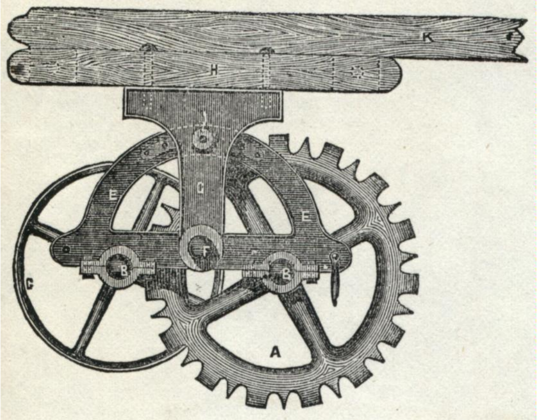
172*a*. Patent Steam Plough; William Smith.



This implement consists of a stout wrought-iron frame, to which there are fixed a double share and mould board, and two subsoilers, with a coulter in front. There are six wheels; the two foremost for the purpose of guiding the implement. The middle ones, in connection with the subsoilers, are used to regulate the depth. The two in the rear are readily depressed and elevated by the lever, and are used to raise the plough from the ground at land's end, and to render it easily turnable on its bows. On removing the double share and mould board, a subsoiler, similar to the other two, may be introduced, and three ploughs, according to the ancient fashion, are at once formed. This plough has in the first instance been used in both forms with the greatest efficiency over an extent of fifty-five acres without a breakage. When used with the double share and mould board, the soil was thrown up in large trenches more efficiently than when like work is performed by the spade. When used with the subsoiler in front, the coldest clay land has been completely shattered, mixed, and pulverised to a depth hitherto unattainable by the common plough; a large flint exhibited was, amongst many others, torn up, split, and thrown to the surface, without the slightest interruption to the course of the plough. From the absence of parving and pressure from the feet of the horses, the coldest clays are, after its operation, left in a state of lightness and friability. When worked backwards and forwards by a stationary 7-horse engine, by means of ropes round windlasses, and the assistance of six men, it has cleared five acres in a day.

173. Patent Regulating Roller and Clod Crusher; F. J. Utting.

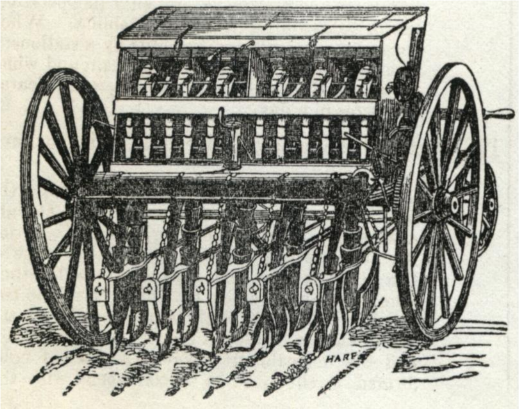
This implement consists of two sets of rings, the front set, A, having sharp serrated edges at right angles to each other; and the back set, C, having flat edges, which revolve between the rings of the other set, so that they clean each other. The moveable frames E, which carry the two spindles, B, B, turn freely on centres at F, in the fixed brackets, G; each bracket has a hole at I and the moveable frames have a series of holes formed in them, so as to correspond with the single hole. By raising or lowering the shafts of the implement, and inserting the regulating pins in the proper holes, the two sets of rings may be fixed and retained in any position that may be desired. It is evident that, by elevating the back or flat rings, their weight must be thrown upon the front or cutting rings, and thus render them more effectual in splitting hard clods; whilst the flat rings still further pulverise and level the soil, and they also prevent the cutting edges from sinking too deeply into the ground. The implement may be used as a roller only, either by attaching the travelling wheels to the front spindle, or, preferably, by balancing the front rings by levers, and a weight attached to the framing, thus throwing the whole weight of the implement and additional weights upon the flat rings.—(See *Practical Mechanics' Journal*, March 1st, 1856.)



174. Improved Form of Tooth for Grubber Harrows, and other similar Agricultural Implements; John Young.

This invention consists in forming the tooth with a projecting tongue or guide in front, so shaped as to be capable of turning off "couch" grass and other accumulations from the front part of the tooth as the implement passes through the ground. By the use of this form of tooth it is no longer necessary to stop the working of the implement from time to time in order to clear the several teeth from obstructions.

174*a*. A general purpose Drill; R. Garrett and Sons.



This drill is for depositing any kind of grain, or seeds, in rows at any required distances apart, together with or without any sort of artifical manures in various quantities, broadcast, or in rows below the seed, so as to lay a proper quantity of mould between the manure and the seed.

175. Patent Vulcan Scythe; J. Boyd.

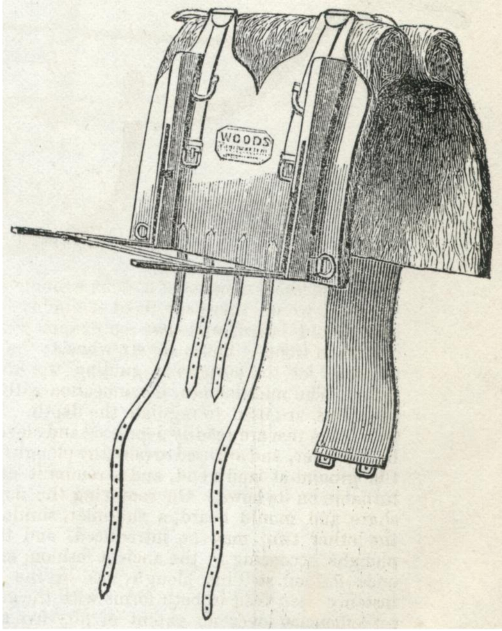
This scythe, being bent or cranked to the required angle before it leaves the manufactory, can be immediately fixed to the snead or handle, according to the position of the body, or the angle required.

176. Patent Double-action or Self-adjusting Scythe; J. Boyd.

177. Patent Lawn Sweeping Machine; J. Jecks.

This machine is adapted to follow the scythe or grass-cutter. With but little more skill and strength than would be required to move an empty wheel-barrow, the grass is swept into a box that will carry about two bushels, and can be readily disengaged for the purpose of being emptied. It will not work when passing over grass that has not been mown, however short, and must therefore be elevated with the lever when moving over that part of a lawn. In taking it to and from its work, it is self thrown out of gear when drawn after the workman, and by means of a lever constructed to adjust the drum, it will also be elevated beyond the reach of injury when travelling.

178. Patent Portable Pack Saddle; G. Woods.



This saddle is light, and folds up into a small compass. Having no tree, it will fit any shaped horse or mule; also, when a horse gets out of condition, it adjusts itself to the back, and requires no stuffing to make it fit. The load is supported at the sides upon iron flanges, which keep it in the same position as when first put on, and prevent the load from rolling about or from slipping. The lining being made of a mat, it clings tight to the sides and back of the animal.

179. Plan for Preventing Accidents by Thrashing Machines; T. Huckvale.

Iron rods are fixed on the stage of the machine, one behind the feeder, and the other at a short distance behind his assistants. Chains are slipped over the rods, and fastened to belts that are buckled round the waists of the labourers. This plan renders it impossible for them to slip or fall on to the rapidly revolving drum.

180. Patent Seakale Pots; J. Pascall.

181. Patent Propagating Pots and Pans; J. Pascall.

182. Patent Lever Self-Kneading Churn; Rev. E. C. Ferryman.

182*a*. Oscillating Churn; G. F. Russell.

This churn is on the same principle as the oscillating steam-engine, only that the motion of the handle on the crank gives oscillating motion to the cylinder which forms the churn, thus producing the combined advantages of a dash and barrel churn.

MISCELLANEOUS.

183. New and Original Designs in Engraved Glass; Pellatt and Co.

No. 1. A group of engraved table glass, of a Greek scroll pattern. No. 2. Water jug and glasses. The jug, an original design by J. H. Wood, with a new adaptation of the Greek honeysuckle scroll. No. 3. Ladies' boudoir water jug and glass. No. 4. Venetian shape champagne glass, with engraved twisted honeysuckle band. No. 5. Handled mug, with a new design in engraving. No. 6. Claret glass, engraved festoons of vine leaves tied up with ribbon. No. 7. Champagne glass, engraved, a small running vine pattern all over. No. 8. Decanter, globular body, engraved neck and shoulder. Nos. 3 to 8 were designed by J. H. Wood. No. 9. Claret decanter, same style as Greek scroll above, but with bright engraving on a dead ground. No. 10. Decanter, globe body, of an Alhambraic pattern. No. 11. Claret glass, of an Alhambraic pattern. No. 12. Champagne glass, engraved honeysuckle scroll.

184. Patent Glass Roller and Cylinder; — Chedgey. Exhibited by Pellatt and Co.

The glass is poured direct from the pot into the moulds. When cylinders are required, the core, which is of iron, is hollow, and the glass is prevented from sticking to the core by a stream of water passing through it while the casting is being made. Thus, pipes for the conveyance of water, acids, and other fluids which act upon metal, may be readily and cheaply made. Glass rollers would be of great advantage in the manufacture of paper, or wherever the machinery is exposed to acids or damp; besides which, a surface is given to fabrics by glass, which the finest polished metal cannot produce. It is expected that these rollers and cylinders may be produced at a very moderate cost, and be made of glass of such hardness as to equal the finest steel.

185. Specimens Illustrative of the Defects in the Manufacture of Crown and Sheet Glass; H. Chance.

(See *Journal of Society of Arts*, Feb. 15, 1856.)

186. Articles in Terra Cotta; J. Roberts.

These specimens comprise a jug recently registered, ornamented with the hop plant; and the British hookah, for the purpose of smoking and purifying tobacco, by drawing the smoke through water.

187. Patent Earthenware Reflectors; — Witty.

188. Patent Silvered and Pressed Glass Reflectors; A. Chappuis.

189. Design for an Inkstand, to be called the Dante Inferno Inkstand; W. Boyton Kirk.

The heads of the monsters are to hold the ink; the head of the victim raises the lid, where stamps, seals, &c., are kept; and the points of the wings are made to rest the pens upon.

190. Curried Leather from the Skin of the White Porpoise —*Delphinapterus leucas*— and a pair of Shooting Boots manufactured from the same material; E. B. Roberts.

This new material was first exhibited in England at the Great Exhibition in 1851, by C. A. Tetu, of Quebec, to whom a prize medal was awarded. It was subsequently shown at New York, but was reported by Professor Wilson not to be an article of commerce. The exhibitor, who holds the principal portion of the skins imported, has been the first to introduce the manufacture in England. Porpoise leather may now be regarded as a permanent manufacture, the Hudson's Bay Company having formed establishments, at Little Whale River and Hudson's Bay, for the capture of the animals for their oil and skins, and having numerous stations at which similar operations may be conducted. The oil, when of the best quality, is perfectly white, and was last sold at auction for £52 per ton. The leather, upon examination by the jury of Class 16, at the Exhibition of 1851, was considered of fine texture; and, upon being tested for toughness, was, with skins of other marine mammalia, believed to be superior to that of land animals. For price, it compares with calf leather of good quality. A sample pair of boots has worn out seven soles.

191. Stamped Leather; F. Leake.

192. Patent Felt Insoled Boots and Shoes; Bowley and Co.

192*a*. Patent Improvements in the Manufacture of Boots and Shoes; W. F. Coles.

This invention consists in applying a lining of thin sheet cork between the ordinary interior lining and the "upper" of a boot or shoe. The object is to promote warmth without interrupting perspiration.

193. Specimens of Materials for Paper, for Cordage or Ropes, and for Textile Fabrics; Rev. T. H. Hastings Kelk.

194. Arras Ecossais; the result of an application of parti-coloured yarns to produce a fabric resembling tapestry; Whytock and Co.

(See *Journal of the Society of Arts*, February 22, 1856.)

195. Printed Alhambra and Barege Long Shawls; B. Salomons and Sons.

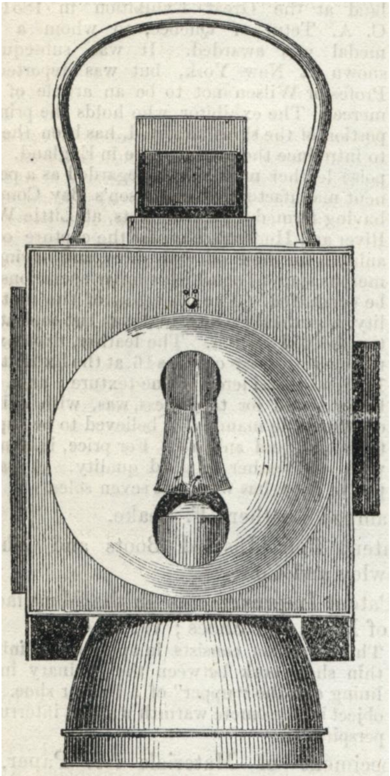
Nos. 101 to 114 were designed, engraved, and printed in London. Nos. 115 to 118 were designed in Paris, and engraved and printed in London. Nos. 119 and 120 were designed and engraved in Paris, and printed in London.

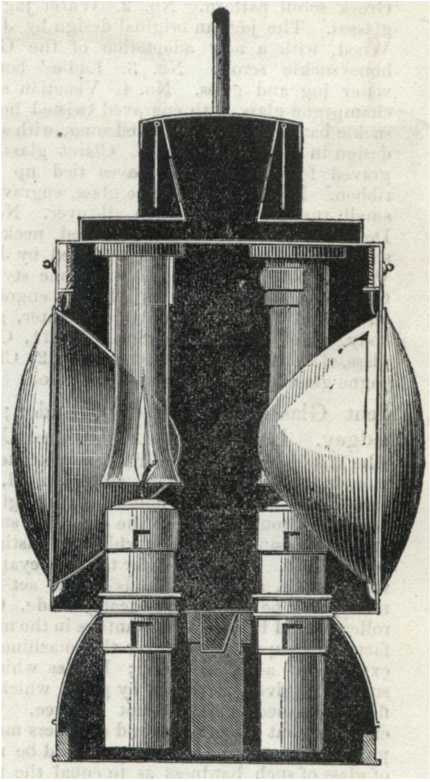
196. Patent Coat, called the "Companion;" R. Levy.

This patent is applicable to all styles of garments, in any material.

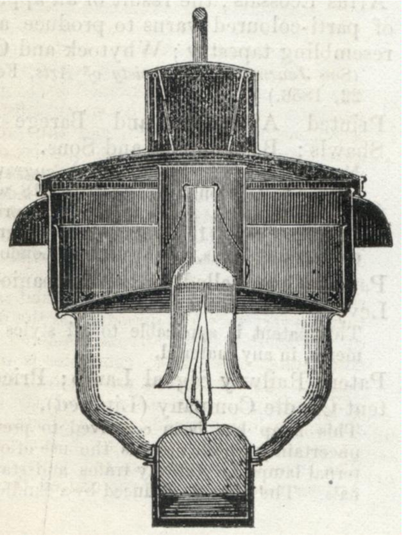
197. Patent Railway Signal Lamp; Price's Patent Candle Company (Limited).

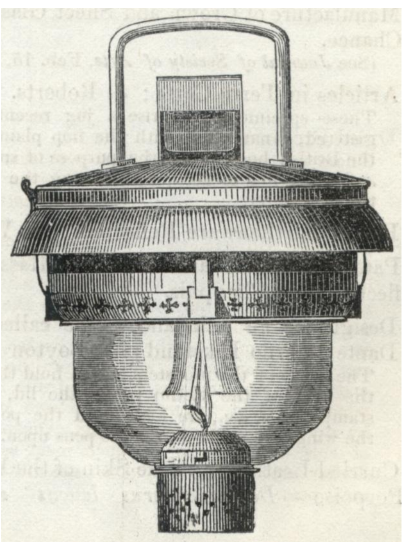
This lamp has been contrived to prevent the uncertainty which attends the use of oil in external lamps for railway trains and station signals. The light is produced by a candle burned upon a spring in a brass tube, and the flame from this candle being in the focus of a parabolic reflector, a powerful and brilliant light is obtained, and of greater intensity than that given off by the ordinary oil lamp with four wicks. The ventilating valves are so arranged that no down-current of air can enter the top of the lantern and disturb the steadiness of the flame. When attached to a train not in motion and in a still atmosphere, the two valves at the top of the lantern will remain open by their own gravity. As a sudden gust of wind, or the rush of air produced by the train in motion, could not, from the construction of the valves, impinge upon them both at the same time, the valve facing the air in motion would close whilst the other would remain open; the products of combustion will thus be quietly carried off, and the air inside the lamp be kept free from agitation.





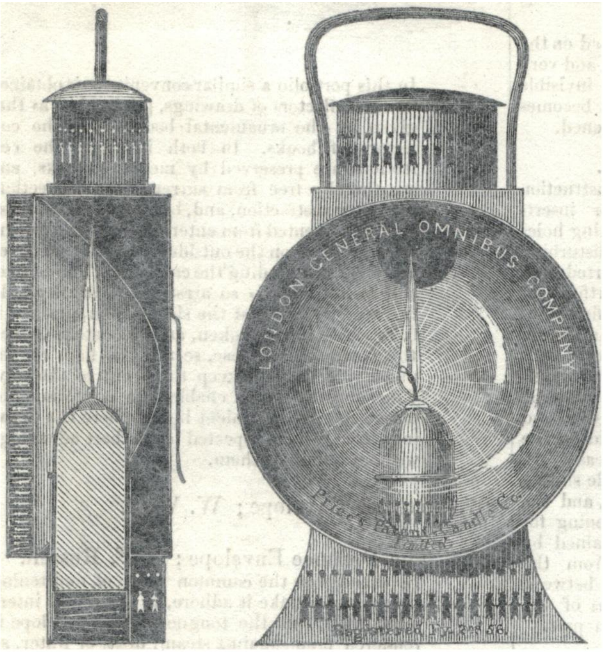
198. Patent Roof Lamp for Railway Carriages; Price's Patent Candle Company (Limited).





This lamp is fixed on the top of a railway carriage roof in the ordinary way. By the introduction of a "dumpy" candle, to be burned in a brass socket containing a spring, a good and uniform light is obtained, which is of equal intensity during the whole duration of the candle. The present difficulty with oil lamps is, that the wicks have to be turned up very high at the commencement of a journey, in order that a moderate light may be obtained at the journey's end; a great deal of smoke is thus made, which sometimes fills and obscures the glass shade; with oil also it is impossible, as lamps have been hitherto constructed, to prevent overflow and waste. With the patent candle lamp there will be no variation in the light, nor will there be any waste of practical moment. This lamp is fitted with the patent valve ventilator, as in the signal lamps.

199. Omnibus Candle Lamp, Registered; Price's Patent Candle Company (Limited).



The smoke and unpleasant vapour given off by the oil lamps that have hitherto been used for lighting omnibuses, has rendered their introduction inside such vehicles objectionable; the consequence of this is, that omnibus passengers suffer much inconvenience at night, and have to travel nearly in the dark. The candle lamp has overcome these difficulties; the candles when once lighted require no snuffing, and being made with very small wicks they burn slowly, and give off a much smaller quantity of the products of combustion than candles used for ordinary lighting purposes. A good and powerful light is nevertheless obtained by fixing the candle in the focus of a parabolical mirror, and transmitting the light reflected therefrom through a ground glass shade. The tube which holds the candle rests upon a small spiral spring, which neutralizes the shocks that the candle would otherwise receive from roads roughly paved.

200. Specimens illustrating the processes for separating the glycerine from neutral fat, and for purifying glycerine by means of distillation, and specimens of fish and of fruits preserved in glycerine; Price's Patent Candle Company (Limited).

(See *Journal of the Society of Arts*, January 22, 1856.)

201. Patent Iodine Soap; J. Lewis.

202. Dried Provisions; John Bethell.

These provisions are dried by a process which drives off all the water *without dissipating any of the original flavour, leaving the constituents of all the juices in a perfectly soluble state.* These dried provisions will keep sweet for many years, and only require to be soaked in water for a few hours, to be restored to their original condition; after which they may be cooked in the usual manner, and will taste as good and afford the same nourishment as when fresh. Broths, soups, and gravies can be easily made from the meats, and syrups and essences from the fruits, a result which, it is said, has never before been attained by any other mode of preserving. One package of this beef contains as much meat as eight similar sized packages of either salt meat or the meat preserved in tins.

203. Cod-Liver Oil Chocolate; François Honoré Lebaigue.

This article furnishes a dietetic matter of high nutritive quality, not only supplying a large proportion of actual animal constituents, but also a nourishing concrete butter, containing a larger amount of nitrogenic principles than any other vegetable substance. The combination consists of 25 per cent. of cod-liver oil, which added to the 25 per cent. of concrete butter, naturally contained in the cocoa berry, gives 50 per cent. of rich oily matter, so combined as to form an emulsion on admixture with water, milk, or the secretions of the stomach, and thus rendered most easy of digestion, without the risk of being rejected. As a remedy these advantages are evident in such diseases as are attended with waste of the body, and have been found in practice serviceable where, from irritability and debility of the mucous membrane, neither food nor more active remedies can be retained in the stomach. In such cases absorption and assimilation are very slow and difficult, and the diffusion of the soluble oily particles, rendered by the combustion effected so complete, is of great benefit. To the medical profession this object is a desideratum, as it not unfrequently happens that this valuable remedy cannot be administered on account of the nausea its odour produces. The inventor has also mixed with chocolate various medicines, and reproduced them in a form convenient for administration. Such are—Chocolate with magnesia, ferruginous salts, iodine and its salts, several of the metallic poisons, &c. Most of the medicinal combinations demand great care in their preparation, but when so made are not only convenient, but surpass in accuracy most other preparations, on account of their dose being so exactly definite, and not being liable to the atmospheric and chemical changes which are apt to alter their power in other modes of administration.

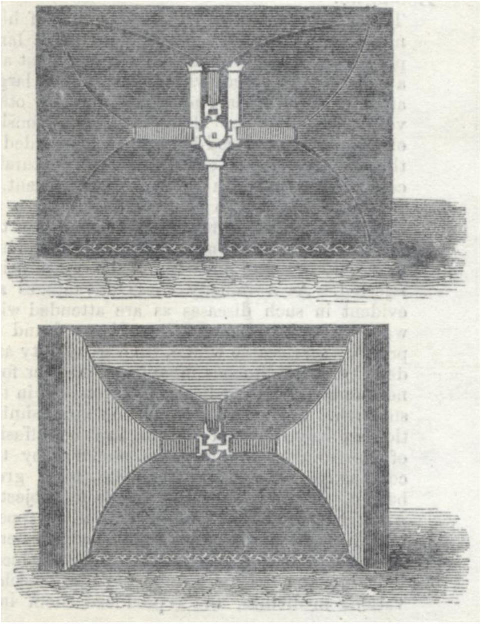
204. Family Bible, with Patent Self-Unfolding Index; D. Ferrier.

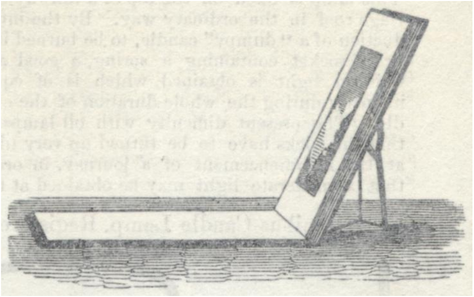
The titles of the several books are printed on the edges of the leaves, in different colours, and very small letters. This index is almost invisible when the book is shut, and only becomes thoroughly visible when the book is opened.

205. Patent Portfolios; E. R. Fayerman.

The principles employed in the construction of these portfolios afford facility for inserting papers, holding them without making holes therein, removing them without disturbing the arrangement of those already inserted, and placing them in any part of the portfolio or within other papers therein. In the first form the portfolio has a moveable frame inside, on which moveable holding strings are placed. To insert a folded paper the frame is to be turned upwards, and the paper passed through it at the back, the holding string coming within the bend of the paper. The frame is then tied to the back, and the paper is held in the case. In the other form the portfolio has a double sliding back, one part having tubular holders, and the other pins sliding into them. An opening for inserting or removing papers is obtained by drawing out one part of the case from the other, and a paper can then be inserted between others or removed, by placing portions of the inserted papers on the holders on each part.

206. Patent Portfolio; G. W. Harvey.





In this portfolio a similar convenience is obtained for the collectors of drawings, prints, &c., as that given by the ornamental bookcase to the collectors of books. In both instances the collections are preserved by means of locks, and are thereby free from surreptitious inspection, injury, or abstraction, and, by means of side-flaps, dust is prevented from entering the portfolio, and these, folding on the outside, prevent any uneven surface from abrading the contents. The catches and locks are also so arranged that they hold the stud flat against the side, which prevents it from easily being broken, and the catches, when the portfolio is in use, secure the flaps on the under side, so as to keep them out of the way. The supporting stud enables the portfolio to be placed in any convenient light, where the drawings, &c., can be inspected to the best advantage without handling them.

207. Detector Envelope; W. West.

207*a*. The Defiance Envelope; G. F. Russell.

In this design the common mode of moistening the gum, to make it adhere, is in no way interfered with, but the tongue of the envelope is rendered proof against steam, heat, or water, so that it cannot be opened without its being known.

208. Safety Coal-Hole Plate; W. West.

209. Patent Decanterer; T. G. Shaw.

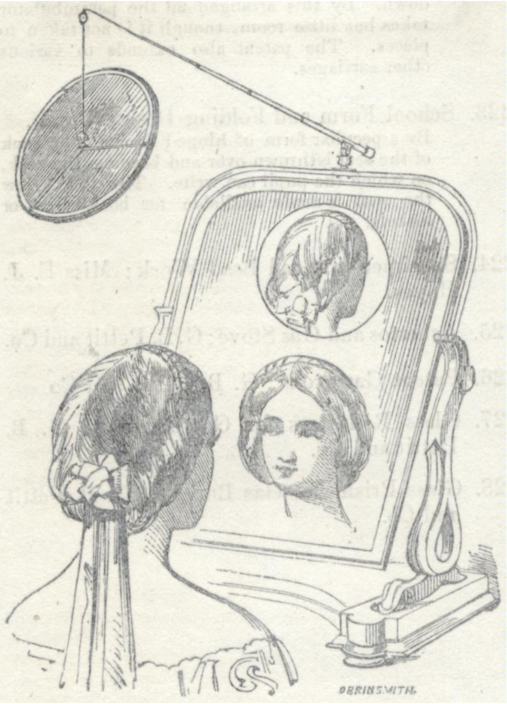
Instead of placing the bottle between the knees, it is fixed in the decanterer, and the cork is extracted without difficulty, and without moving the bottle, which may then be raised so as to pour out the whole or any portion of the contents without the slightest disturbance of the crust or sediment, the bottle remaining in the same condition until again elevated or lowered.

210. Specimens of an Improved Method of Ornamenting Gilt Surfaces; D. J. M'Lauchlan and Son.

211. Model of Looking-Glass Frame Carved and Gilt, Ornamentally Burnished, with unfinished Details; D. J. M'Lauchlan and Son.

212. "Le Miroir face et nuque;" Heal and Son.

This patent toilet glass possesses the peculiarity of reflecting the back of the head as perfectly as it does the face, on one surface at the same time, thereby enabling a lady to arrange her back hair with the greatest ease and precision. A brass telescopic rod, with a circular mirror suspended from it, is attached to the top of an ordinary toilet glass, and when the rod is drawn out in the position shown in the drawing the back of the head is at once reflected in the glass; when not required for use, the circular mirror can easily be placed back at the top of the glass, so as not in the least to interfere with the ordinary use of the glass.



213. Improved Fire-Lighter, to be called the Funnel Fire-lighter; W. H. Newman.

The funnel fire-lighter is produced by tying together sticks and blocks of fire-wood, in such a way as to give them the shape of a funnel, or of a hollow truncated cone or pyramid. It is the result of an endeavour to embody the art of fire-lighting, and make the operation easy and certain to unskilful persons. In this simple form are combined the means of a thorough draft of air through the mass of fuel to be lighted, and of a lateral expansion of flame sufficient to ignite the mass; and from numerous experiments it is believed to be a never-failing fire-lighter, without the need of bellows or any other attention. It has, besides, the property of concentrating superfluous flame, or the flame which, in lighting a fire, is projected beyond the stove, and of causing it to rise in a tongue or jet above the centre of the grate, so that the fire is useful for cooking or similar purposes the moment it is lighted. Being placed in the midst of the fuel to be lighted, it cannot throw out sparks in front, which makes it especially safe when children are employed to light fires. When used, it should be placed in the centre of the fire-place, with no cinders beneath or within it. Coals and cinders should then be thrown upon it. A plug of shaving in the aperture at its summit prevents them falling into the article, and they will roll down its sides and surround it. They should be thrown on until it is nearly buried in them; then, should anything remain over the aperture, it should be removed, and the shaving thrust down to the bottom and lighted. The best way to light the shaving is to place a lighted match beneath the grate.

214. Patent Anti-Deceptive Metallic Reels; J. P. Clarke.

215. Registered Potato Steamer; — Bentley.

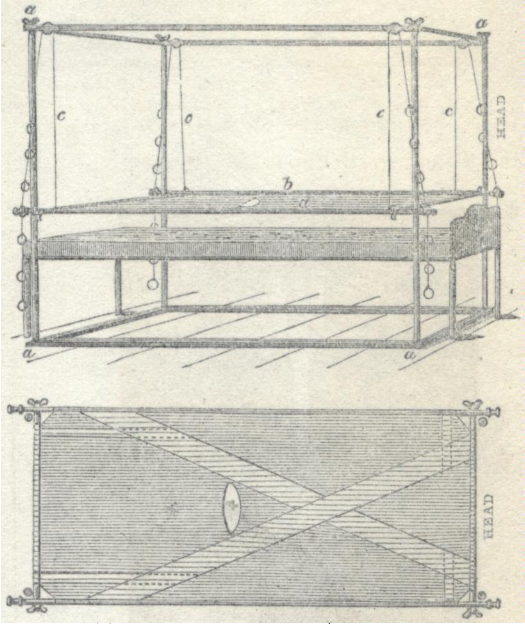
216. Prepared Cork Soles for Shoeing Horses, Cork Washers, Axle and Machinery Bearings, &c.; F. Haines.

217. Patent Metal Dinner and Dessert Forks; I. Jones. Exhibited by F. Haines and Co.

These improvements consist in producing a dinner and dessert fork with the advantage of the spoon and fork combined, by reducing the length of the prongs to about one-fourth of the usual length now in use, and making the upper part of the blade of the fork into a kind of spoon by indentation, so as to be useful in taking up gravies and other soluble matter.

218. Cabinet Letter Clip; D. Rooke.

219. The Nightingale Cradle, an Apparatus for the Use of the Wounded or the Helpless Sick; T. Dixon.



This apparatus is moveable and applicable over any kind of bed, and is of such easy and sure management that the nurse in attendance may, unaided, change the patient's under bed-clothes, &c., as often as the case requires, and that so gently as not even to interrupt the patient's sleep. The original has been in use for a year and a half. Fig. 1, *a a*, the supporting frame, formed of angle iron, top and bottom, and tube iron posts screwed in at bottom, so as to be easily removed. *b*. The cradle and suspending sheet;

the side pieces of ½ or ¾-inch tube iron, the ends of the same with pins projecting from the extremities, to pass through small holes in the side-rods, and fasten with horn-nuts. *c.* Cords passing over pullies, one end fastened to side rods, the other having a succession of rings to slip on end of rod as each corner in its turn is gradually raised. *d.* The sheet, made with a hem all round, to admit the rods easily, and of such a size that, when fixed, it may lie on the bed as an ordinary sheet. Fig. 2. Under side of suspending sheet with crossing bands of the same material, to bear the principal weight of the patient, thus taking all strain from the opening left for cleansing purposes. With this arrangement, ordinary linen or strong calico is sufficient to bear the weight of a heavy person.

220. Registered Metallic Scroll Guard; T. Trotman.

This guard is intended to be attached to the axletree, spring, or back of hand-carriages or perambulators, to obviate the possibility of the carriage throwing over backwards.

221. Registered Promeneur Carriage; T. Trotman.

The formation of this lever carriage is adapted for the reception of children sitting back to back, thereby securing an easy and safe balance, also allowing the youngest child to see its attendant, the propelling handle being moveable, and admitting of any adjustment necessary.

222. Patent Folding Perambulator; T. Trotman.

This contrivance is constructed upon the same principle as the folding chair, but with additional strength. It economises space, as it will stand in the hall, or may hang upon a nail, out of the way. The arms are jointed by raising up the fore part of the arms and pressing the footboards and back together. It is folded in a moment. This is all that is required for general use, but, if close packing is desired, by removing the thumb screw, the handle folds close to the back of the carriage, and on unbuckling the strap, the front wheel folds closely down. By this arrangement the perambulator takes but little room, though it is not taken to pieces. The patent also extends to various other carriages.

223. School Form and Folding Desk; Burch.

By a peculiar form of hinged bracket, the back of the seat is thrown over and becomes the desk, on which the pupil can write. The space below the seat is made available for book-cases or lockers.

224. Specimen of Seed Bead Work; Miss E. J. Hayes.

225. Asbestos and Gas Stove; G. B. Pettit and Co.

226. Patent Gas Irons; G. B. Pettit and Co.

227. Glass Reflectors for Gas Burners; G. B. Pettit and Co.

228. Glass Prisms for Gas Burners; G. B. Pettit and Co.

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